

THE IRON AGE

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Reading Matter Contents.....page	156
Alphabetical Index to Advertisers "	184
Classified List of Advertisers "	174
Advertising and Subscription Rates "	167


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See page 55

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49 CLIFF STREET

NEW YORK

THE IRON AGE

New York, Thursday, July 8, 1909.

The Wood Turret Machine Company's Plant.

When first organized two years ago the Wood Turret Machine Company occupied a leased shop at Terre Haute, Ind., where the first Tilted Turret Lathe was built. But it was soon seen that more room and better facilities would be required. To meet these conditions a site was

boiler room 25 x 50 ft., and is covered with a self-supporting circle arched roof surmounted by a windowed monitor top. A solid concrete floor slightly crowned covers the entire building, the interior of which is abundantly lighted by side and top windows. Except for the uprights required to support the line shaft on the operating side, there are no posts obstructing floor space.

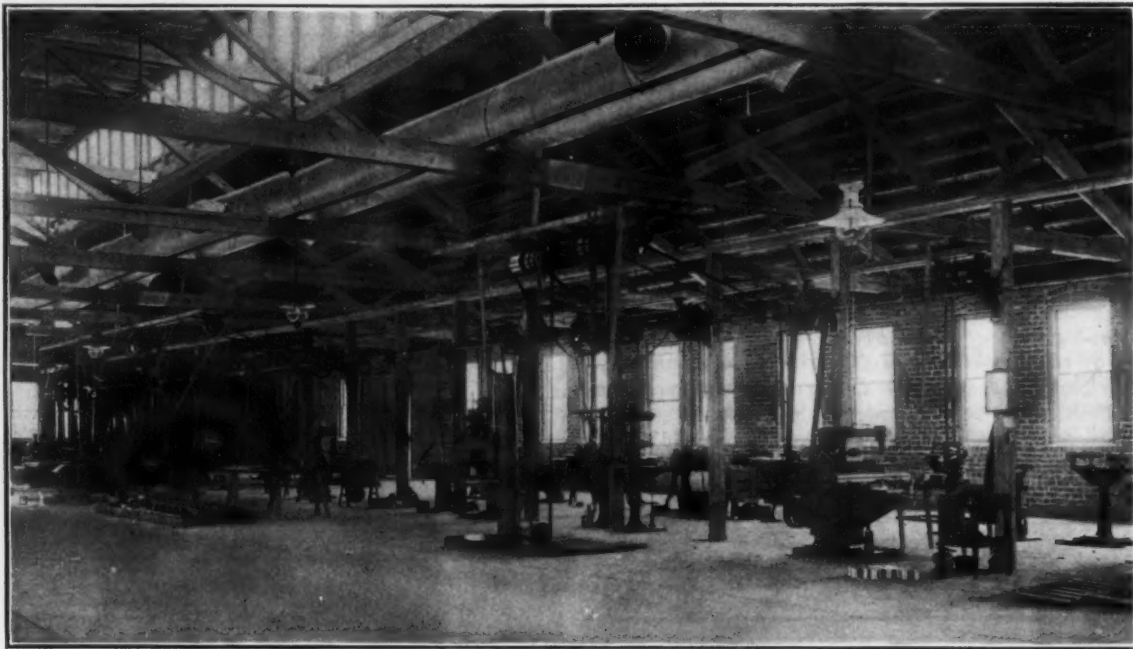


Fig. 1.—The Machine Tool Section.



Fig. 2.—The Erecting Floor.

Views in the Wood Turret Machine Company's New Plant at Brazil, Ind.

selected at Brazil, Ind., upon which the new factory was built, being first occupied by the company on April 1 of this year.

The initial building of what will eventually be a group of shops is located in the center of a five-acre tract adjacent to the Vandalla Railroad, with which it is connected by a switch track 500 ft. long. It is a one-story brick structure 80 x 200 ft., with an adjoining

In Fig. 1 is shown the principal part of the tool equipment which will be added to later on. The tools are arranged as nearly as possible in the order of operation, the heavier machines occupying positions toward the center of the floor, while the lighter finishing tools are arranged in two lines back of these, adjacent to work benches along the wall. All material enters the shop at the rear end, as seen in this view, and moves

forward along the line of tools in successive order. The opposite side of the shop, shown in Fig. 2, is occupied as an erecting floor and affords ample room to accommodate a large number of machines without crowding.

All of the tools are driven from a single line shaft, either directly or through countershafts on either side. Steam for the operation of the plant is supplied by a 100-hp. boiler located in a brick addition to the main building, and motive power is furnished by a 75-hp. self-oiling vertical engine, Fig. 3, which drives the line shaft, an electric lighting dynamo and the fan of the heating and ventilating system. The latter comprises a very complete installation designed to heat the shop at 68 degrees F., with an outside temperature of 10 degrees below zero. This equipment includes an 8-ft. left-hand, top vertical discharge fan, Fig. 3, made by the American Blower Company, designed to supply 14,385 cu. ft. of air per min. running at 225 rev. per min. The air, passing over steam coils heated by exhaust steam from the engine, is distributed evenly through the building by an overhead discharge pipe extending through the center of the shop from one end to the other. This pipe, which is 42 in. diameter at the intake, tapers in sections to 18 in. diameter at the discharge, and where a branch is carried into the office located in the northwest corner of the shop. Both gas and electricity are used for artificial lighting, current for the latter being generated within the plant, as is that required for the operation of electric drills and grinders. Chipping and cleaning tools are operated by compressed air from a belt-driven compressor.

The hardening department, Fig. 4, is equipped with pyrometers and Stewart hardening furnaces in combination with a high-speed forge and drawing crucible for the treatment of parts that require tempering. Opposite this department are the pattern and enameling rooms, both of which are conveniently arranged and modernly equipped. For the convenience of workmen a speaking tube connecting with the tool room just outside the of-

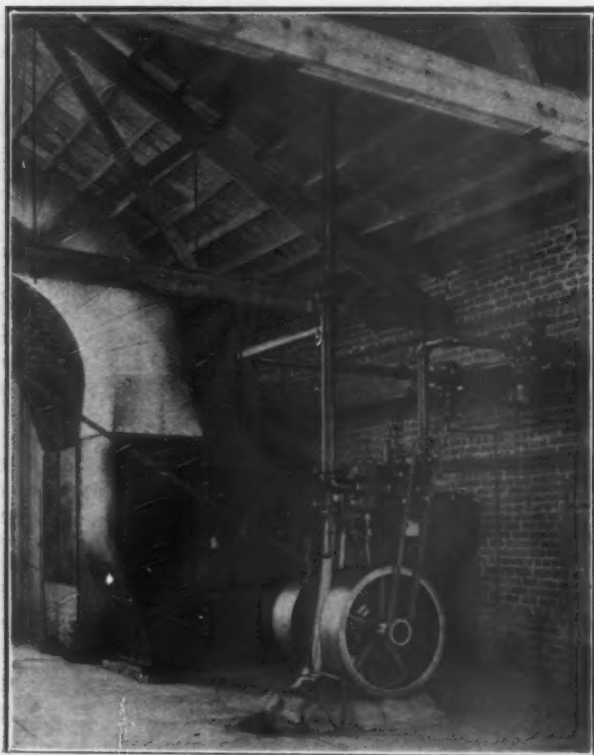


Fig. 3.—The Engine and the Heating and Ventilating Plant.

fice is placed near each machine, so that the tool room attendant can supply the tools required upon order, taking the operator's check in return.

Future plans contemplate the erection of another building as large or of greater size alongside the present shop, both of which will be served by a switch track running between them. Space has been reserved on the other side of the factory for a foundry, which is a further improvement in anticipation. Every part of the Tilt-

ed Turret Lathe, except the castings, is manufactured by the company, under a duplicate system of jigs and gauges, which makes each part interchangeable; and to insure accuracy and uniformity all taps, gauges and jigs are made to conform to Brown & Sharpe micrometer measurements, which have been adopted as a standard.

The following tools are included in the equipment already installed: A No. 1, a No. 2 and a No. 3 tiled tur-

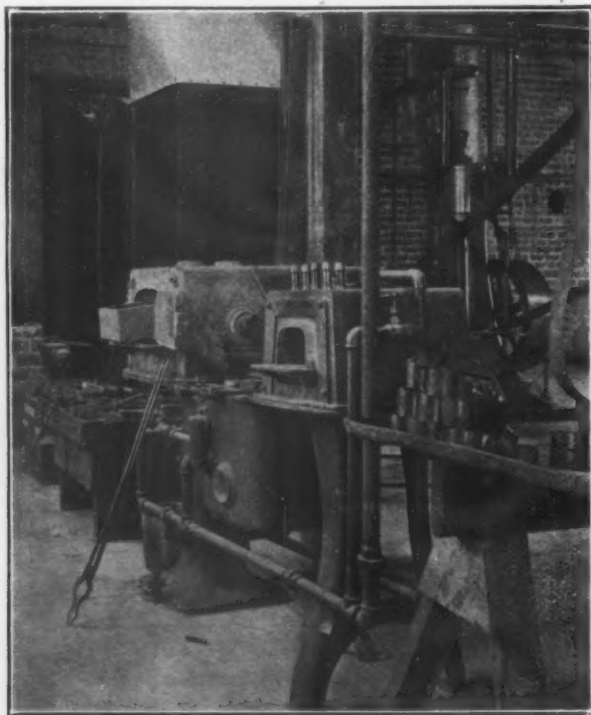


Fig. 4.—The Forging and Tempering Department.

ret lathe; a 3½-in. Pearson automatic forming machine; a 32 x 32 x 10 ft. Cincinnati planer; a 14-in. Smith & Mills shaper; a No. 2 Wm. E. Gang radial drill; a No. 2 A and a No. 3 plain Milwaukee miller; two Henry & Wright high speed drill presses; a 22-in. Snyder drill press; a Davis No. 2 key seater; a Q. & C. cutting off saw; a No. 5 and two No. 2 Greenfield arbor presses; two 16-in. Chicago grinders; a 16-in. Chicago buffer; a 26 x 10 ft. Pond lathe; a 22 x 10 ft. Whitcomb-Blaisdell lathe; an 8-in. Blount grinder; a 16 in. by 8 ft. Flather lathe; two 14-in. Reed lathes; a 12 in. by 5 ft. speed lathe; a No. 3 Chicago hand miller; an automatic chuck grinder; a cutter grinder; a No. 3 Landis universal grinding machine, and an 18-in. Becker-Brainard automatic gear cutter.

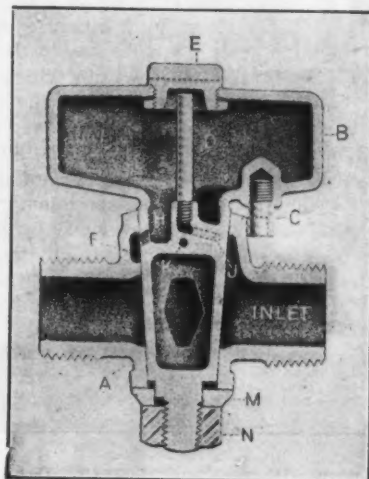
Contracts Placed for the Jones & Laughlin Tin Plate Plant.—The Jones & Laughlin Steel Company, Pittsburgh, has placed a contract with the Standard Engineering Company, Ellwood City, Pa., for the building of 12 hot tin mills and 15 cold mills for its new tin plate plant to be erected at Aliquippa, Pa. The company will eventually have a 30-mill tin plate plant at Aliquippa, but for the present only 12 hot mills will be installed. The tin plate bars for the new tin mill will be rolled by the company at its mills on the South Side, Pittsburgh, but after the new steel mill at Aliquippa is built the bars will be furnished from that plant. The Fort Pitt Bridge Works, Pittsburgh, Pa., has received a contract for the pit furnace building for the new steel plant at Aliquippa.

J. H. Linton, formerly chemist for the Vilter Mfg. Company, Milwaukee, and A. W. Gregg, who held a similar position with the Bucyrus Company, South Milwaukee, are now in Seattle, Wash., where they have formed a partnership and have established the Pacific Coast Testing Laboratory, to be located in the Fern Building, Third avenue. They will make a specialty of foundry metallurgy.

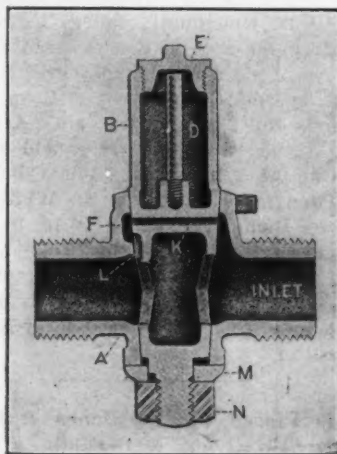
The Lunkenheimer Oil-Air Cock.

For rock drills and coil punchers, a device made by the Lunkenheimer Company, Cincinnati, O., combines in one compact fitting a valve or cock for regulating the air supply and a lubricant reservoir for supplying the oil. It automatically and positively feeds the oil in regular quantities each time the cock is closed and opened. Thus the lubrication is practically continuous, as the drilling machine is shut down on an average of every 2 or 3 min. to start a new hole, to change tools or for other causes. With the oil style oil cock, the oil is supplied spasmodically in large quantities and for a few minutes the machine is flooded, but for the greater part of the time the machine is running dry.

The operation is apparent from the sectional views showing the cock in open and closed positions. The cock is connected so that the pressure is taken at the end marked "inlet," and the reservoir, which also acts as the



Closed.



Open.

The Lunkenheimer Combination Air Valve and Lubricator for Rock Drills and Coal Punchers.

handle, is filled with oil. The drilled hole J communicates with the tube D and registers with the inlet port when the cock is about half open; therefore, when the cock is opened and closed, the hole J passes the inlet port each time and allows the air pressure to enter the reservoir through tube D. This pressure forces a charge of oil through passage H into the pocket F when the cock is entirely closed; when opened, passage K registers with the inlet on one end and pocket F on the other, allowing the air to blow through to force oil out of the pocket into the main current, to be carried with it into the cylinder. This operation is repeated each time the machine is shut down and started, thus providing positive and practically continuous lubrication. The reservoir can be refilled when in a closed position with the pressure on, as passage J is then shut off.

This device possesses several important advantages; it saves space because of its compactness; it is very simple and convenient to operate; and by providing a regu-

lated lubrication it saves oil, reduces wear and prolongs the life of the drilling machine. It is made of such materials and proportions as to be amply strong to withstand the rough usage such fittings are subjected to. The body is made of malleable iron, the plug, filling cap and washers of bronze, and the nut of steel. The body and nut are made rust-proof by the sherardizing process. Three sizes are made— $\frac{1}{2}$, $\frac{3}{4}$ and $1 \times \frac{3}{4}$ in.; the latter size has a 1-in. inlet connection and a $\frac{3}{4}$ -in. outlet.

Poor's Manual for 1909.

The forty-second annual number of *Poor's Manual* was published last week. It is the largest volume of the entire number, having about 100 pages more than the 1908 edition and 400 pages more than the 1907 book. The statistics cover the 1908 fiscal and calendar years, and in some cases information is given which was received after June 1, 1909. In addition to the railroad data, there is a comprehensive industrial section. Other features of the 1908 edition have been continued, including the bond list, tables of annual meetings and dividends, &c., the industrial section being similar in detail and style of presentation to the railroad section.

The total mileage of the steam railroads in the United States December 31, 1908, was 232,046 miles, an increase in the year of 3918 miles.

The total capital liabilities of the railroads, including stock, bonds, equipment obligations, &c., were \$17,234,886,215, as against \$16,501,413,069, shown in the previous publication, an increase in the year of \$743,473,146. Of the total increase \$183,786,301 was in stock and \$560,272,788 was in bonds. The table below gives the income account of the railroads of this country for the year 1908 as compared with 1907:

Miles operated.....	228,285.73	225,227.23
Passenger earnings.....	\$575,246,516	\$574,718,578
Freight earnings.....	1,650,989,952	1,825,061,858
Miscellaneous	180,783,342	202,977,087
Totals.....	\$2,407,019,810	\$2,602,757,503
Net earnings.....	\$717,802,167	\$833,839,600
Other receipts.....	183,380,314	128,015,081
Total available revenue.....	\$901,182,481	\$961,354,681
Payments:		
Taxes	\$82,377,619	\$74,253,245
Interest on bonds.....	304,475,354	280,931,001
Other interest.....	30,605,970	23,759,329
Dividends on stock.....	237,565,478	247,258,219
Miscellaneous	108,749,192	75,176,725
Rentals—Interest	36,308,746	38,188,406
Dividends	30,008,582	31,087,374
Miscellaneous	21,647,564	18,127,456
Total payments.....	\$851,738,105	\$788,781,755
Surplus	49,444,376	172,572,926

It will be noticed that the surplus for 1908 is less than 30 per cent. of that for 1907. It compares also with \$151,474,773 in 1906, \$121,876,014 in 1905 and \$92,620,020 in 1904.

In addition to 230,085 miles of railroad represented in the statistics of earnings given in the book (1961 miles having been completed after the end of the fiscal years of the various roads) there are 103,691 miles of second track, sidings, &c., making a total of 333,776 miles. Of this trackage 8970 miles are of iron rails, against 9320 miles in 1907 and 19,181 miles in 1901. The following items are of interest, with corresponding figures for 1907:

	1908.	1907.
Passengers carried.....	891,275,003	860,648,574
Passenger mileage.....	28,985,670,148	28,166,116,577
Revenue per passenger mile.....	1.950 cents.	2.040 cents.
Tons freight moved.....	1,521,065,494	1,722,210,281
Freight mileage.....	215,698,911,350	228,137,507,807
Revenue per ton mile.....	0.765 cent.	0.782 cent.

The entire gas, electric light and power system in the city of Stillwater, Minn., formerly owned and operated by local companies, has been sold at public auction by the receiver for \$370,000. These properties will be taken over by the Washington County Light & Power Company, incorporated by Homer W. McCoy and Joseph H. Roy, Chicago, and Ernest L. Hospes of Stillwater. The property acquired includes the plants and franchises of the former owners, together with their rights in the Apple River Power Company, which supplies current locally and to St. Paul.

NOTES ON TESTS OF INGOTS

And Derivative Shapes in Progress at Watertown Arsenal.*

BY JAMES E. HOWARD.

The question which claims early attention in the examination of ingots and derivative shapes is that of structural soundness and uniformity, the lack of which may result from the partial welding of interior cavities or from the presence of foreign material, slag of whatever chemical composition it may be.

The present tests have been arranged in a manner intended to develop information on the causes which detract from soundness of structure and to aid in attaining this end the material from the ingot through the several reductions to the finished rails is being examined as it is revealed on both longitudinal and transverse sections of

the ingot. Upon smooth polishing it was found convenient to acquire information upon entrained slag, locating the zones in which slag in globular form was present, counting the number of such globules and measuring their diameters. The positions of the slag zones changed in going from the bottom toward the top of the ingot. When the upper portions were reached, where blowholes were encountered, the slag was found to have gathered in larger beads and rested on the lower walls of the cavities. The appearance of these slag globules is shown by the accompanying photomicrographs, Figs. 1 and 2, the magnification being 62.5 diameters. In one the globule is surrounded by ferrite; in the other it is not.

Upon etching these slices with tincture of iodine a fernlike interlacing structure was shown in the metal adjacent to the sides of the ingot, within which a mottled surface was located. The appearance of the surface developed by the iodine was dissimilar to that brought out by etching with picric acid. It was found that the structure developed by iodine and that by picric acid could be shown simultaneously on the same specimen.

Fig. 3 shows the structure developed by picric acid, natural size, of a section taken near the bottom of an ingot. The elongated grains next the sides of the ingot are shown oriented with their longer axes normal to the cool-



Fig. 1.—Photomicrograph Showing Slag Globule as Found in Steel Ingot. Globule Surrounded by Ferrite. Magnification 62.5 Diameters.

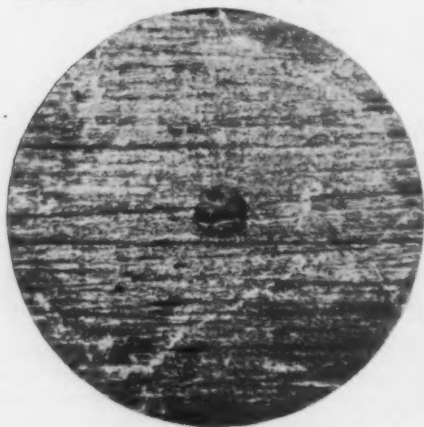


Fig. 2.—Photomicrograph Showing Slag Globule as Found in Steel Ingot.—Globule Not Surrounded by Ferrite. Magnification 62.5 Diameters.

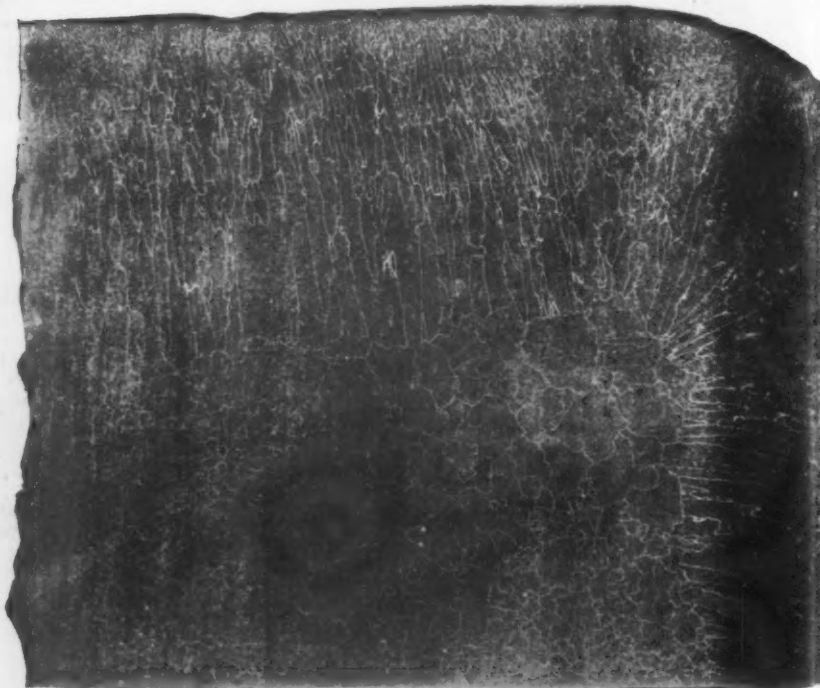


Fig. 3.—Cross Section of Steel Ingot Near Bottom End.—Structure Developed by Picric Acid. Natural Size.

the different shapes. This part of the inquiry has required a considerable amount of machine work in cutting up the material, polishing and etching of the sections so that photographic records could be obtained.

This preliminary work is largely of an illustrative nature in which the successive changes in appearance of the steel are followed from pass to pass. In this manner it is believed explanatory data will be acquired and the significance of those markings which characterize etched steel surfaces in general will be made known. A large number of photographic negatives represent the status of the work at the present time.

Beginning with the ingot, the longitudinal and cross sectional slices showed to the unaided eye those cavities due to gases or shrinkage which commonly are found in

ing surface of the ingot, while within are found grains differing in size, but undistorted in their shapes.

Fig. 4 shows both structures, the iodine having been employed on the sample after it had been etched with picric acid.

The fernlike structure is present in a number of the subsequent passes, but lost before the final passes of the rail are reached. In the bloom it is faintly visible. The mottled portions are more or less nebulous and indistinct. As the metal is reduced in the rolls the markings generally become more sharply defined, but it will be borne in mind that the intensity of these streaks and darkened places will appear very differently according to the conditions of etching.

Slag inclusions which are globular in the ingot are gradually extended as the metal is rolled down. Fig. 5 shows the appearance of a streak, viewed longitudinally,

* A paper read at the Meeting of the American Society for Testing Materials, Atlantic City, N. J., June 29, 1909.

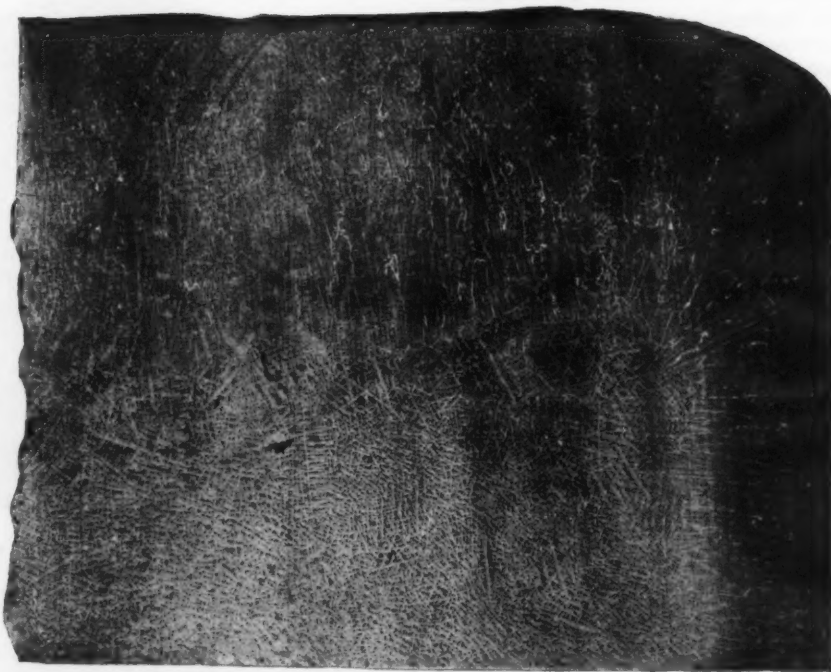


Fig. 4.—Cross Section of Steel Ingot Near Bottom End.—Structure Developed by Etching Sample with Tincture of Iodine After It Had Been Etched with Picric Acid. Natural Size.

in metal after the ninth pass from the ingot. When viewed in cross section this and similar places in the steel showed rounded or approximately circular boundaries.

It seems reasonable to suppose that the starting places of streaks or hairline cracks are at the ingot where slag inclusions initially are found. The query suggests itself whether a hairline crack may not extend during the rolling of the metal for a greater distance than the slag itself is drawn out. Such seemed to be the case in the specimen represented in Fig. 5.

The large number of slag globules which may be present in parts of the ingot are sufficient to account for the short fine lines or cracks numerous in certain rails which have been examined.

In regard to gas cavities, blow holes or shrinkage

reference to the rails subsequently rolled therefrom, furnishes rails in which evidence of this treatment is present in nearly all of the rails from whatever part of the ingot they came. Fig. 6 shows the characteristic markings on the cross section of a rail from such an ingot, and the location of the streaks on that side which was upper-

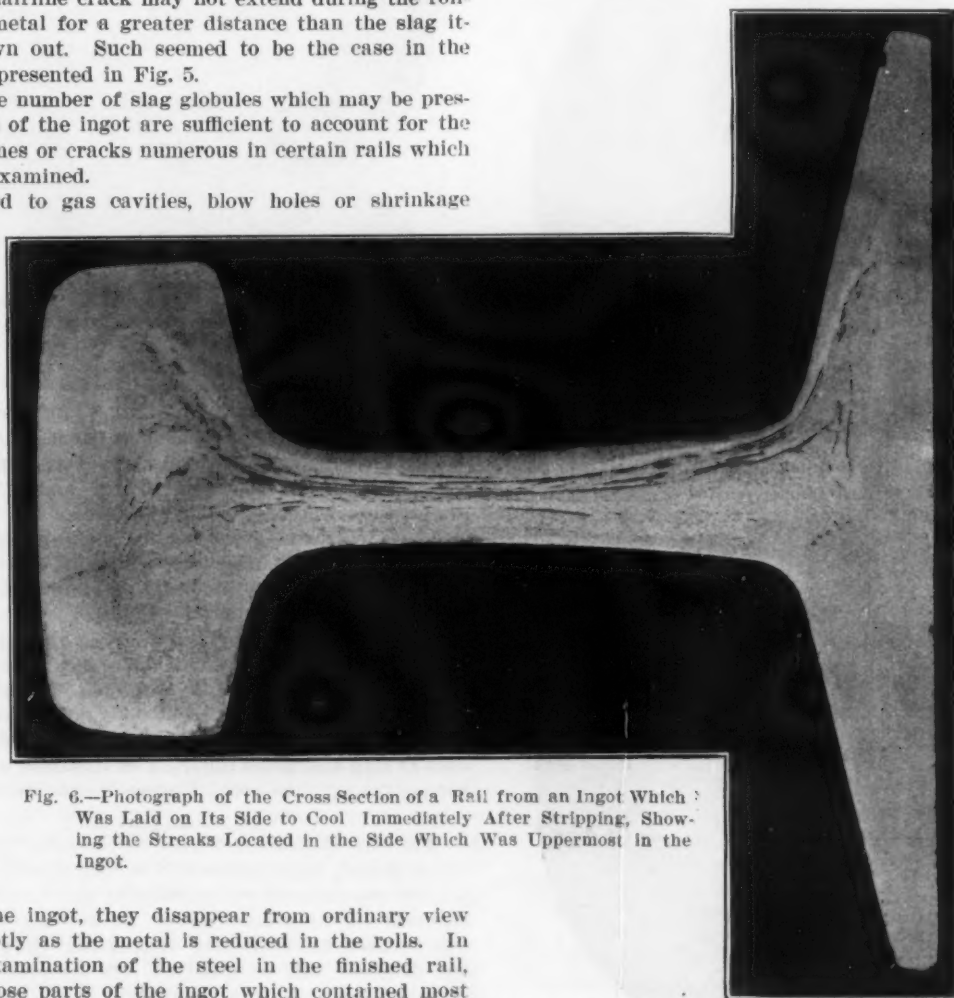


Fig. 6.—Photograph of the Cross Section of a Rail from an Ingot Which Was Laid on Its Side to Cool Immediately After Stripping, Showing the Streaks Located in the Side Which Was Uppermost in the Ingot.

cracks in the ingot, they disappear from ordinary view quite promptly as the metal is reduced in the rolls. In the final examination of the steel in the finished rail, however, those parts of the ingot which contained most of the blow holes furnish rail sections containing the largest number of streaked lines.

It is further significant that an ingot laid on its side to cool, immediately after stripping, web side up with

most when the ingot cooled.

Some special tests were made on the welding of rail steel, using the stems of tensile specimens for the purpose. Polishing and etching the best parts of the welds

made on these specimens, the welding having been done in the open air, gave the results shown by Figs. 7 and 8. While the junction of the two parts may be easily seen, still there are crystals which extended over this line.

In the case of the granular structure of the ingot, as developed by etching with picric acid, and illustrated in Fig. 3, lines of rupture followed the boundaries of the elongated grains when the metal was fractured by a

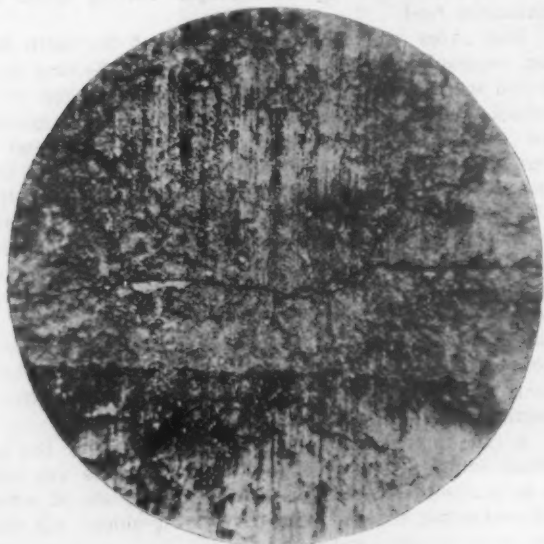


Fig. 5.—Streak in Metal After the Ninth Pass from the Ingot. Magnification 50 Diameters.

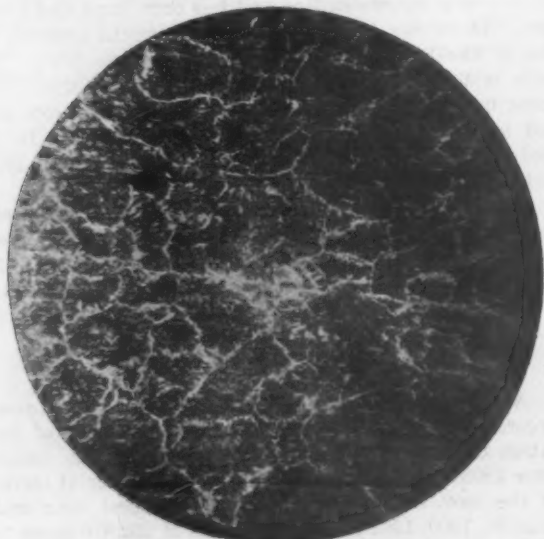


Fig. 7.—Photomicrograph of Weld in Rail Steel.—Magnification 62.5 Diameters.

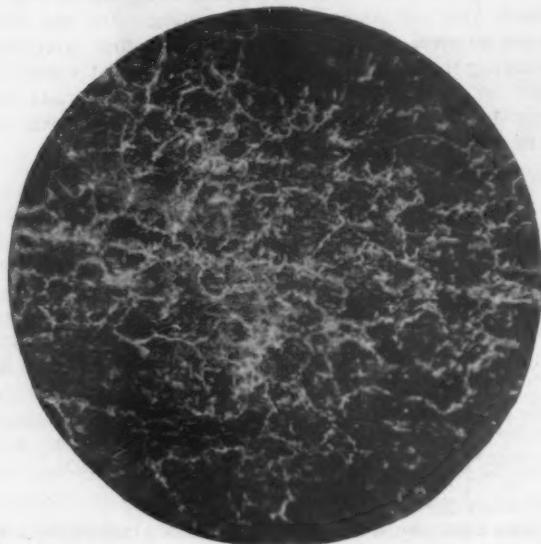


Fig. 8.—Photomicrograph of Weld in Rail Steel.—Magnification 62.5 Diameters.

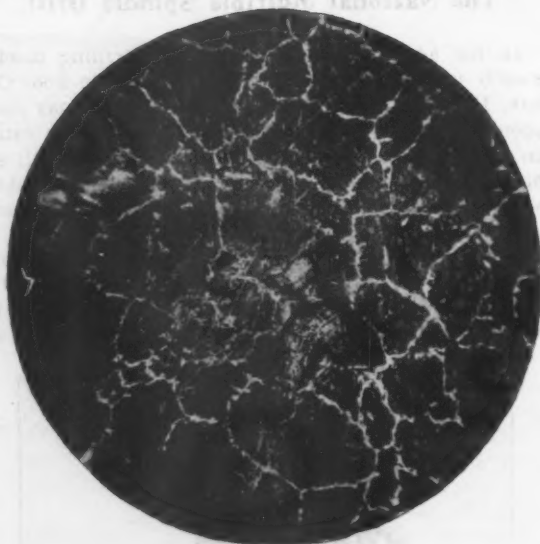


Fig. 9.—Photomicrograph of Section of Rail Steel from an Early Pass, Showing Appearance Before Compression Loads Were Applied.—Magnification 62.5 Diameters.

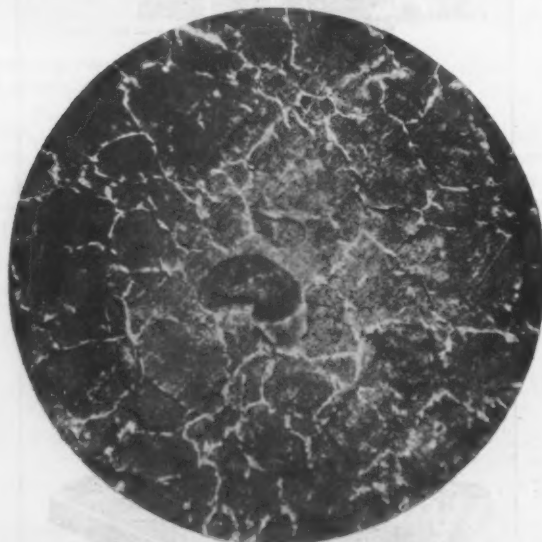


Fig. 10.—Photomicrograph of Section of Rail Steel from an Early Pass, Showing Appearance After Compression Loads Were Applied.—Fractures Developed Along Ferrite Line. Magnification 62.5 Diameters.

transverse load. Tests of a similar kind were made on steel from one of the intermediate passes in which metal having a coarse grain was selected. Figs. 9 and 10 show the appearance of the metal before and after loads of compression were applied, the effect of the loads being to cause fractures separating the metal along the ferrite lines. Marks seen near the centers of the photomicrographs were made by a needle point for the purpose of identification.

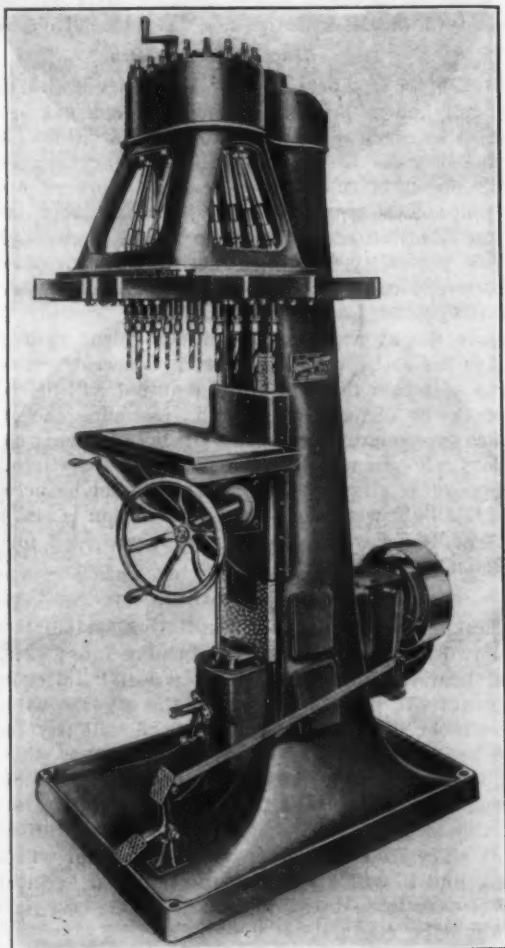
In conclusion, it may be remarked that the markings commonly brought out on the cross sections of steel rails by etching are believed to be those which have their origin in the ingot, modified by subsequent treatment, and that the state of the metal in the ingot, as regards presence of slag and zones differing in structure at this stage, carries through the several passes to the finished rail.

The city of Seattle, Wash., is planning improvements to its electric light and water works system which will call for the expenditure of \$800,000, this sum having been provided for by a bond issue. Of this amount, \$400,000 will be used for extending distributing lines in the city and \$100,000 will be spent for the foundation and preliminary work of a new dam 60 ft. high, which will impound several million gallons of water at Cedar Lake to tide the city over the dry season. The remainder of the budget will be applied to the liquidation of obligations and various incidentals.

The National Multiple Spindle Drill.

In the adjustable multiple spindle drilling machine recently produced by the National Automatic Tool Company, Dayton, O., the speed of each spindle may be independently varied and different sizes of drills can be run side by side. Nevertheless the machine is still suitable for a large range of work, is sufficiently rigid to use high speed steel drills, is capable of a large output of work and will drill closely spaced holes.

The power is delivered from a friction pulley through a change speed box and bevel gears to a main vertical shaft in the column. Five cone gears revolve on this main vertical shaft in the head and through three sep-



A Multiple Drill with Spindles Independently Adjustable in Position and Variable in Speed, Built by the National Automatic Tool Company, Dayton, Ohio.

arate series of compound and idler gears deliver the power to each independent spindle gear. The spindle gear speeds obtained from the five cone gears are 500, 750, 1000, 1500 and 2000 rev. per min. These cone gears are thrown into action by three sliding keys located in the shaft. One key engages the lowest gear, one key the next two gears and the third key the two remaining gears. Thus, any one or any two or three of these cone gears not controlled by the same key or keys can be engaged at once to transmit corresponding speeds to the spindle driving gear.

If only one size of drill is being used all of the cone, compound and idler gears not involved are stationary if the corresponding sliding keys in the shaft are disengaged. The changes above enumerated, together with three changes in the speed box and three in the feed box, will give practically any desired speed.

The spindle driving gears are keyed to their respective shafts. By means of a bronze gear fork, through one end of which the spindle shaft runs and through the other end of which a screw operates, the spindle driving gear is raised or lowered quickly into three different speed or three neutral positions. Thus such spindles as are not in use can be placed in the neutral positions and

remain idle, thus saving wear on all of the associated parts. The screw is operated from the top of the machine and indicators on each screw show the exact position of the spindle driving gear within the head.

With the initial speed in the change gear box fixed the desired spindle speed can be obtained independently by raising or lowering the respective spindle gear within the head. A 1-16, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ -in. drill can be run side by side, each at their proper cutting speed and maximum feed.

Ball races are placed between all of the main driving, compound and idler gears in the head—ring rollers in the speed box and ball thrust bearings on top of the vertical shaft in the column. All gears in this machine are cut from the solid and all gears in the head and the feed and speed boxes and vertical shaft within the head run in an oil bath. An oil pump to continuously circulate the oil is located within the column on the change gear box. Hardened and ground bushings are provided in the idler and compound gears in the head, and run on hardened and ground studs. The adjustable rails are made of cast steel and of sufficient proportions to obviate any deflection of the drills even under the heaviest feeds. The spindles are of tool steel and run in hardened and ground bushings. Adjustment for different length of drills is provided within each spindle.

A unique construction has been adopted for the universal joints. The cube and its four pieces are made from one solid piece, thus obviating the use of screws for connecting the cube and the driving sides. All wearing surfaces are hardened.

The work table has a large oil groove, is constructed so that T slots can be used; has a large bearing on the column, is counterweighted and has both hand and power feed. There is a 16 $\frac{1}{2}$ -in. vertical adjustment between the end of the largest drill and the top of the table. The table is also equipped with an automatic knockout. The speed box has three changes of speed for cast iron, steel and brass and sliding change gears are used. In the feed box the sliding key change is used to obtain 1 $\frac{1}{2}$, 3 and 4 $\frac{1}{2}$ in. feed.

The machine is equipped with a foot pedal for throwing the power on and off. An oil pump and a large reservoir for lubricant for the drills are also provided. The machine is built in different sizes, one type with a square head carries up to 12 spindles and another with a rectangular head up to 20 spindles.

American Shipbuilding in the Fiscal Year 1909.—

According to the official report of Commissioner of Navigation Chamberlain the year's output was the smallest since 1898, but new contracts indicate a material increase in the new fiscal year. During the fiscal year ended June 30, 1909, 1362 merchant vessels of 232,816 gross tons were built in the United States and officially numbered by the Bureau of Navigation, compared with 1506 of 588,627 gross tons in the fiscal year 1908, which was the record year of American shipbuilding. On the Great Lakes 36 steel steamers of 88,426 gross tons were built, including the Shenango, 8047 tons, the largest vessel ever built on the lakes. No vessels for foreign trade were built during the year. Of the year's output 60,952 tons were barges and canal boats.

Fewer failures with greatly diminished liabilities, compared with the first six months of 1908, occurred in the United States during the first half of the current year, according to statistics gathered by commercial agencies. R. G. Dun & Co. report that total failures aggregated 6831 with liabilities of \$88,541,373 since January 1, compared with 8709 failures and \$124,374,833 in the first half of 1908. Bradstreet's figures makes the number of failures so far this year 6149, with liabilities amounting to \$80,651,976, compared with 7562 failures having \$178,782,769 liabilities, in the first six months of 1908.

The first month's attendance at the Alaska-Yukon-Pacific Exposition at Seattle was 667,971 and the net profits were \$86,000.

Compulsory Factory Ventilation.

Justification of the New York State Law.

BY C. M. RIPLEY, NEW YORK.

It costs money to purify anything. Whether it be the Panama Zone that must be made habitable or a political situation which requires a house cleaning, all of these worthy enterprises require considerable expenditure, and there will always be found some who protest. Even our worthy pure food law came in for its share of complaint, and now we learn that the New York labor law, requiring a supply of fresh air for the employees of workshops and factories, is being subjected to some criticism.

Ventilating Requirements Reasonable.

The law reads as follows: "The owner, agent or lessee of a factory shall provide, in each workroom thereof, proper and sufficient means of ventilation, and shall maintain proper and sufficient ventilation; if excessive heat be created, or if steam, gases, vapors, dust or other impurities that may be injurious to health be generated in the course of the manufacturing process carried on therein, the rooms must be ventilated in such a manner as to render them harmless so far as practicable."

William W. Walling, Chief Factory Inspector for the State of New York, interprets the law as follows: "As defined by Dr. John S. Billings, perfect ventilation means that any and every person in a room takes into his lungs at each respiration air of the same composition as that surrounding the building, no part of which has recently been in his own lungs or those of his neighbors, or which consists of the products of combustion generated in the building, while at the same time he feels no currents or drafts of air, and is perfectly comfortable as regards temperature, being neither too hot nor too cold. How much air is required to meet these conditions? Not less than 2000 cu. ft. per hour for each person, with the same amount per hour for each cubic foot of gas consumed whether for light, heat or power."

Some landlords in New York City have put forth the claim that the amount of fresh air specified by the Department of Labor was an "arbitrary quantity." Several authorities on the subject of ventilation who have been consulted in the matter and who are also entirely disinterested, agree that 2000 cu. ft. per hour per person is common practice, and is based upon definite laws or rules which have been followed for many years in the design of ventilating systems.

"The Architects and Builders' Pocketbook," written by Frank E. Kidder, C.E., Ph.D., states that 1800 cu. ft. per hour per child should be the standard for school buildings, this amount being required by law both in Massachusetts and New York. It further states that in buildings more closely packed, and occupied for a longer period, the air supply should be from 2000 to 2500 cu. ft. per hour per person. In giving an example of a school room of certain dimensions, he shows that the standard amount of air would result in the air in the room being changed about eight times per hour, which certainly does not appear to be an excessive amount.

Since the above applies only to buildings where people sit quietly or for buildings where children only congregate it is difficult to see how the representatives of the New York Department of Labor can justly be accused of any "arbitrary" action in interpreting the meaning of "proper and sufficient" ventilation.

Percival Robert Moses, consulting, heating and ventilating engineer of New York City, states that he has found the rate of 2000 cu. ft. per hour per person a satisfactory and conservative working basis. This was used in designing the ventilating equipment of the large department store of B. Altman & Co., in the Rikers' Island Penitentiary, in the Baltimore Stock Exchange and in the new Hearst Building at San Francisco, as well as in others, and he states that the operating expense for a system laid out on this basis has not been found excessive and will not be if due care is taken at the time of installation.

Example of a Loft Building.

In a loft 25 ft. wide and 100 ft. long, containing 80 workmen and lighted with electricity, the amount of air required would be $80 \times 2000 = 160,000$ cu. ft. per hour. This amount of air would be sufficient to change the air in the loft six times per hour, assuming a 10-ft. ceiling. Since the Massachusetts, New York, Pennsylvania and New Jersey laws for school rooms receive eight changes per hour and since some authorities recommend even 50 per cent. in excess of this, it appears that the action of the factory inspector hardly comes within the definition of the word "arbitrary," which in the "Standard Dictionary" means "done capriciously," or "without adequate determining principle," or "nonrational—not done according to reason or judgment—depending on the will alone—tyrannical—despotic—not fixed by rule."

Regarding Gas Lighting.

Dr. Daniel R. Lucas of New York City states that it is a well known law of hygiene that one gas jet will consume as much oxygen as five persons. Since electric lighting—thanks to the new high efficiency lamps—has been reduced in cost 50 per cent. or more, it appears that the easiest way to comply with the labor law regarding ventilation would be to abandon gas lighting. In New York City especially this would seem advisable, as electricity can be bought by meter from the street or from the power plant down stairs.

Since the average gaslight is equivalent to five persons, as far as its vitiating effect is concerned, it can be readily seen that the ventilation required will be reduced five-sixths by abandoning gaslight, assuming one gas jet to each workman. Or stating it in another way, the landlord who clings to gas lighting must install ventilating apparatus six times as large as would be necessary if electric light were used. This calculation is also based upon conditions where one gas jet is provided for each workman.

Regarding Operating Costs.

The operating cost for a ventilating system is made up of two items: (1) Power for turning fans; (2) additional heat for incoming air. In a loft building where the tenant will pay for the power the expense will automatically be divided, and the landlord will pay for the extra heat required, since heat is included in the rent. It will also be noticed that again the adoption of electric lighting will cut the bills for operating expense to a remarkable degree. This cut in expense will affect the tenant, since a much smaller ventilating motor will be required, and it will also affect the landlord because less air will have to be drawn in, and hence the cost for heating would be diminished.

In large systems the services of an expert heating and ventilating engineer would probably prove valuable, and it is possible to so design the equipment that a judicious "recirculation" of the air from halls and basements will effect an economy in the fuel bill. This air is seldom impure and requires much less heat than if cold air were brought in from outside. It is also possible in buildings where high pressure steam is available, or where boilers which have been run at low pressure can be run at a higher pressure to adopt the following policy: Provide steam engines to operate the fans and turn the exhaust steam into the heating coils, thus getting a double use out of the steam and cutting down the electric bill. This idea could be carried still further in many instances, and economies could be made (especially in the winter) by abandoning electric pumping, again lowering the electric bill. This is the stock argument of the advocates of isolated plants, who contend that great economies result in buildings of 1,000,000 cu. ft. or more if engines are installed and electricity is made on the premises. It is a fact that steam at high pressure only contains about 6 per cent. more heat than steam at low pressure. Thus the argument that electricity can be made and a building heated with exhaust steam is advanced. Many do not appreciate one very peculiar fact about steam: that at 5 lb. pressure it is only about 6 per cent. cheaper to make than at 100 lb. pressure, showing that the cost does not increase in proportion to the pressure.

Conspicuous Illustration of Loft Building Ventilation.

In the future it is probable that factories and loft buildings will be equipped with ventilating apparatus at the outset, with the ducts concealed in the walls and the fans located in the basement. A model building of this character has recently been completed at 37-43 West Twenty-sixth street, New York City, in which the landlord at the time of construction had the ventilating systems installed at his expense after the design of a prominent consulting engineer. Thus the cost of operating a system and the responsibility of maintaining it in good condition does not rest upon the tenant. At the present writing we are informed that the owners of the West Twenty-sixth street corporation, with offices at 725 Broadway, have already rented eight out of 12 floors—a flattering reception and appreciation of the advantages they have to offer.

It is natural during this transitory period and before the betterment of the standard of building construction has become general, that some differences are bound to arise between the factory inspection bureau and the landlords and tenants. It is to be hoped that this condition is but temporary.

Health and Money Value of Ventilation.

In the report of the United States Bureau of Labor at Washington, D. C., it is shown that deaths among factory workers due to consumption were divided as follows:

	Per cent.
Employees exposed to metallic dust.....	36.9
Employees exposed to mineral dust.....	28.6
Employees exposed to vegetable fiber dust.....	24.8
Those exposed to animal and fiber dust.....	32.1

The occupation showing the highest consumption mortality was grinders, among whom 49.2 per cent. of all deaths were from that disease.

An ingenious conclusion was reached by Frederick L. Hoffman of the Prudential Life Insurance Company, based on this report. It is his opinion that by intelligent methods of ventilation and dust removal the consumption death rate among the wage earners would result in an annual saving of 22,238 lives. This would add, quoting the *Engineering News*, 15.4 years of life for every death from consumption avoided by rational conditions of industrial life. Such a gain would represent a total of 342,465 years of additional lifetime, and by just so much the industrial efficiency of the American nation would be increased. Placing the economic value of a year's lifetime at only \$200, the total average gain to the nation would be \$3080 for every avoidable death of a wage earner from consumption, representing the enormous total of \$68,493,000 as the annual financial value clearly within the range of practical attainment. Therefore, nothing within reason should be left undone as a national, State and individual or social duty to prevent that needless, but now enormous, loss of human life from consumption, due to the unfavorable conditions in American industry.

None will deny that the efficiency of workmen varies with their good health and comfort. Slight physical ills are prevented by better surroundings, says William H. Tolman, and the loss to the employer due to absences, or brains made stupid by breathing foul air, are immediate losses to the employer through lowered efficiency, and later involve a loss of trained employees and the necessary breaking in of green help.

Alloy Steels for Motor Car Construction.—The American Vanadium Company, Frick Building, Pittsburgh, Pa., has reprinted in pamphlet form an address on the above subject by Dr. John A. Mathews of the Hallcomb Steel Company, Syracuse, N. Y., which was delivered before the Mining and Metallurgical Section of the Franklin Institute and printed in the *Journal* of that society for May. The address describes the various kinds of alloy steels and their treatment, and gives tables, typical analyses, treatments and tensile tests of nickel, nickel-vanadium, chrome-nickel and chrome-vanadium steels.

The Enterprise Multiple Strainer.

For clarifying water in boiler feed lines, condenser lines, injector lines, water works, water pumps, centrifugal circulating and turbine pumps, cooling systems in connection with blast furnace tuyeres, &c., multiple cleaners are now quite commonly employed. They are a development of the old type foot valve strainer which has been extensively used for preventing foreign matter, usually present in natural sources of water supply, from passing into the supply pipe. Disadvantages of the ordinary foot valve strainer are that it is located under water and cannot be examined when in operation, that the cleaning operation requires considerable labor and that it cannot be cleaned without stopping the flow of water. On the other hand a multiple strainer can be cleaned without affecting or in any way interrupting the flow of water, and it can be so located as to be conveniently accessible at all times. Fig. 1 herewith shows a cross sectional elevation of a multiple strainer made by the Enterprise Machine Mfg. Company, 2625 Sarah street, Pittsburgh, Pa., and Fig. 2 a side elevation partly in section to expose the basket.

The multiple strainer consists of a substantial iron casing having two passages, each intercepted by a removable basket-shaped strainer so mounted that each strainer can be quickly placed in service position. The by-pass between the basket chambers has the function of releasing and equalizing pressures before and after removing the strainer baskets for cleaning. The flanged caps covering the baskets are held by four bolts, the hole slots for which are to facilitate removing the flange caps. The valves, valve stems and valve disks are all bronze. The perforated strainers and all fittings connected with them are of brass.

In operation the multiple strainer is simple and effective.

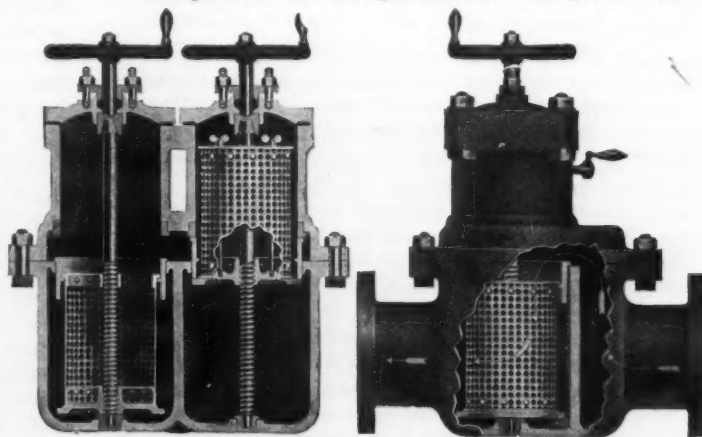


Fig. 1.
Fig. 2.
Sectional Elevations of the Multiple Strainer Made by the Enterprise Machine Mfg. Company, Pittsburgh, Pa.

The perforated cage or strainer basket catches and retains all suspended foreign matter in the water. The baskets are alternately thrown in and out of service by the simple operation of raising or lowering respectively, these movements automatically cutting off or again permitting the flow of water. For example, the operation of raising the strainer basket for cleaning at the same time closes the valve leading to that strainer basket chamber. By means of the by-pass the pressure is relieved in the chamber containing the strainer to be cleaned. The four bolts holding the flanged cap are then removed from the slots and the flanged cap lifted off, permitting the strainer to be lifted out and cleaned in a few seconds. After the clean basket is replaced and the flanged cap bolted on, the by-pass valve is turned to allow equalization of pressure in the two chambers before lowering the strainer basket into service position.

It is claimed that the straining area of the baskets averages 50 per cent. greater than that of similar devices as now made. The position of the basket when lowered in the chamber permits the full perforated area of the basket to be brought into service. The size of mesh used in the strainer baskets depends upon the requirements. The company's standard pattern is designed for 250 lb. standard flange connections, but it can be modified to conform to any required specifications.

The American Society for Testing Materials.

A Summation of the Papers and the Reports of Tests of Iron and Steel Presented at the Twelfth Annual Convention at Atlantic City, June 29 to July 3, 1909.

The convention of the American Society for Testing Materials at Atlantic City, N. J., last week gave new proof of the vitality and the widening influence of that organization. Though the youngest of the national engineering societies, it takes high place in the volume and value of its annual output of literature and in the extent to which the results of original research are made available through its proceedings. Though founded to promulgate standard specification for materials of construction and to secure uniformity in such requirements, the society has gradually included collateral lines. Thus its contributions to the metallurgy of iron and steel are by no means small or unimportant.

Bringing together manufacturers, engineers representing manufacturers and engineers representing consumers, with a considerable percentage of consulting engineers and engineers representing technical schools, the society's work has at times drawn sharp lines between opposing interests. The debates over steel rail specifications are a case in point. But this diversity of interest has proved an effective clarifier and has given the shortest cut to results. Now that the steel companies and the railroads have come to a better understanding, rail questions develop less heat at the Atlantic City meetings, and other matters are coming forward. For instance, corrosion and preservative coatings for iron and steel promise interesting developments.

Last week's convention had before it almost an embarrassment of plenty. No less than 61 papers and reports were scheduled for the nine sessions. The new specifications for steel rails, vessel and bridge steel, boiler steel, tires and splice bars; the reports on failures of steel in service; the summary of progress in the government investigations of fuel and structural materials in the past year; the reports on corrosion and the tests of preservative coatings; the notes on heat treatment of steel and the papers on mechanical treatment for improving the structure of steel; the details of the tests of steel I beams and girders carried on by Secretary Marburg and of those at Watertown Arsenal by J. E. Howard—all are of interest to readers of *The Iron Age*. Separate sessions were devoted to cement and concrete and to bitumens and oils, and paint interests started a discussion at another session that raised some issues—for example, whether linseed oil may be used in paints for the covering of concrete.

In the following report the matters bearing on iron and steel and related lines are referred to in such space as is available. The great mass of material presented at these meetings—last year's *Proceedings* amounting to 706 pages and those of the preceding year to 759 pages—precludes even mention of some of the subjects considered. The registration showed 280 persons present and the total was probably over 300.

GOVERNMENT INVESTIGATIONS.

Importance of the Fuel Inquiry.

J. A. Holmes gave a résumé of the fuel investigations carried on by the United States Geological Survey in the year ending June 30, 1909. The testing plant formerly used at St. Louis and later at Norfolk, Va., has now been established at Pittsburgh. Over 1500 analyses have been made of coals from 500 mines, these representing the larger deposits in all the important fields of the country. A volume has been brought out devoted to these analyses. A second volume has been published containing the results of 500 boiler tests showing the relation between analyses of coal, calorimeter tests and evaporative tests. A third volume is devoted to producer gas tests.

An important branch of the work has been to find out

how best to use low grade fuels in gas producers, and experiments have been made using coals of 30 per cent., 40 per cent. and 50 per cent. ash in the Taylor producer. When this matter was taken up with operators in the Pittsburgh District they at first said they did not have any low grade coal, but it was found that they had been leaving at the mines 6 ft. of such coal. The bureau has taken out some of these low grade Pittsburgh coals and has found that for use in the gas producer they equal the best Illinois coal.

Another line of work carried on is the determination more accurately of the chemistry of combustion, and for this inquiry a large combustion chamber 40 ft. in length has been employed. The standardization of calorimeters has also been undertaken. Again the bureau has found that the differences in the character of volatile matter are greater than have been taken account of. Still another investigation has taken up the different types of petroleum to determine their behavior and efficiency in various kinds of oil engines. The popularity of the sale and purchase of coal under specifications has been increasing. One thing which the work of the bureau has emphasized is the great wastefulness of present methods of mining. In the past year it may be fairly estimated that the loss of fuel through improper mining methods was 250,000,000 tons, a loss which cannot be recovered. What is becoming plainer is that there must be a revision of prices of fuel in the United States which will permit of taking out all the coal, the low grade with the high grade, so as to prevent the enormous losses now going on.

DISCUSSION.

R. H. Fernald told of some investigations he had made in Europe of what is being done in the concentration of power plants at the mines for the utilization of low grade fuels. In England little has been accomplished, but the speaker found coal mining companies there willing to co-operate in the study of the subject. One important company is making producer gas at the mines, but is utilizing its best coal in the producers. Germany has made some headway. At one mine he found that a mixture of culm and roofing slabs containing 53 per cent. ash is being used in producers. At another plant in southern Germany roofing slabs with 60 per cent. ash are being used and gas is being furnished for a 1000-hp. and a 250-hp. engine, while a 500-hp. engine is being installed. Gas is also being used under boilers at this plant. Power is furnished for local electric lighting and for the operation of an electric railroad. In this country, in connection with the Government fuel tests, peat has been used in producer plants with good success. The speaker visited some plants in Sweden installed at peat bogs and through the connected gas engines high voltage current was being sent into towns for lighting and manufacturing purposes. It has been demonstrated in this country that not only can high ash fuels be used for the production of gas, but that plants for the distribution of power can be put at the mines and made a commercial success.

Tests of Structural Materials.

R. L. Humphrey presented a summary of the work done in the past year by the structural material testing laboratories of the United States Geological Survey. A large part of the work heretofore done at St. Louis will now be transferred to Pittsburgh. About 10,000 tests have been made in the year and 700 specimens analyzed, involving 6000 determinations. About 1400 concrete beams have been tested and comparisons made with beams made by different companies, varying mixtures being used. A study has been made of the effect of time

on concrete beams; also an investigation of sands, crushed stone and gravels. Wire and manila rope tests have been made and the effect of corrosion on wire has been investigated. A furnace and a freezing chamber have been provided for the investigation of effects of high and low temperatures on the building stones of the country. A bulletin is about ready for publication covering waterproofing tests and the permeability of sands, mortars and concretes. Firebrick and terra cotta tiles are being investigated, one line of inquiry being as to the load carrying capacity of firebrick and other clay products. It is shown that the load carrying capacity falls as temperature increases. Progress is being made in building the new 10,000,000-lb. testing machine, and the heavy parts will be shipped to Pittsburgh this summer. The Atlantic City laboratory started last spring is studying the action of salt water on cements. It is found that lime passes into salt water and that there is a decrease in the content of magnesia. At Northampton, Mass., laboratory tests are being made of the material furnished for the Panama Canal.

In the comment on this elaborate programme of work R. A. Cummings referred to the great need of the investigation the bureau is making into the properties of firebrick. He had found an astonishing lack of information on their product among firebrick manufacturers.

The Watertown Arsenal Tests.

J. E. Howard gave further "Notes on Tests of Ingots and Derivative Shapes in Progress at Watertown Arsenal, Mass.," as given elsewhere in this issue. In another paper he added to the data presented at last year's meeting on the tests of steel columns he is conducting at Watertown.

REPORTS ON STANDARD SPECIFICATIONS.

Committee A on Iron and Steel.

The report of Committee A on Standard Specifications for Iron and Steel was presented by Secretary Marburg in the absence of the chairman, William R. Webster, who is in Europe. The new specifications for steel rails, structural steel and boiler plates, tires and splice bars have already been printed (or the changes pointed out) in *The Iron Age* (June 17, page 1922, and July 1, page 26). The suggestion of the committee that a separate committee on specifications for wrought iron be appointed was approved by the society and the title of Committee A will hereafter be "On Standard Specifications for Steel."

Secretary Marburg read a letter from Col. E. D. Meier, chairman of the Committee on Uniform Specifications for Boilers, favoring a limit of 0.04 per cent. on phosphorus and 0.03 per cent. on sulphur in boiler steel. These limits were adopted by the committee for firebox steel, but for flange steel the committee's specification allows 0.06 per cent. phosphorus and 0.04 per cent. sulphur. In the discussion that followed the point was made on behalf of the steel manufacturers that such refinements in chemical specifications would greatly increase the cost of material for boilers without securing such an increase in safety as the advocates of these severe requirements evidently expected. Mr. Wickhorst made the point that the life of firebox steel is more a function of the condition of service than of the quality of material, abuse of such steel being a much greater cause of failure than the chemical composition. Albert Ladd Colby suggested that 15 or 20 years ago the volumetric method of analysis was used quite commonly, and a sulphur content found to be 0.03 per cent. by that method would by the more accurate method of to-day be found to be 0.04 per cent. Prof. H. M. Howe raised the question whether the possible sulphur limit had not been reached in steel, in making which American coal is used. If the manufacturer of steel is crowded down by such exacting specifications the result might be to force him to slight his work in some other way.

The revised specifications as reported by Committee A were referred to letter ballot.

Suggested Specifications for Annealing.

Professor Howe presented the report of Committee F on Heat Treatment of Iron and Steel. He said the com-

mittee was practically unanimous in the view that the rate of cooling should preferably be hastened through the critical range, but one member held that cooling ought to be very slow through the critical range. The object of hastening the cooling there, Professor Howe said, is to prevent ferrite from separating out in a coarse network. By cooling rapidly the idea is to get a finer network and less marked planes of low cohesion. The committee's report, with the chairman's preface, is as follows:

It is not quite clear that the committee is expected to prepare specifications for annealing, or that such specifications are in themselves needed or desirable. They are, therefore, presented tentatively, without recommendation as to their adoption. It is for the society to decide, as a matter of general policy, whether the adoption of any specifications on this subject is wise. Different manufacturers follow different methods of annealing, and it would probably be very difficult to compel all makers to follow these or any other set of directions. Indeed, many makers of steel castings would refuse either to disclose or to discuss their annealing procedure. The aim in preparing these specifications has been to draw up something which would be of use, first to those who are not already very skillful in such matters, and second as standards to which practice might be referred in case of dispute as to whether a given treatment was reasonable or not. Though skillful steel workers may follow methods more refined than those which we here offer, yet such methods may be less suitable than ours for the particular purposes here in mind.

REPORT.

The Committee on Heat Treatment respectfully recommends the following methods of annealing normal carbon steel, containing not more than 0.90 per cent. of carbon, and with the other elements in their usual proportions. All the directions, except that concerning steel castings, refer to the critical points. In case of steel of unusual composition, the committee advises that the critical points should be specially determined, so that these directions may be modified in accordance with actual determinations. It is to be remembered that, in the slow temperature changes of industrial annealings, the critical points lie nearer to their true or theoretical position than they do when determined by the usual method of taking heating and cooling curves. That is to say, the actual position of Ac1 and Ac3 in practical annealing is slightly below, and that of Ar1 and Ar3 is slightly above, the temperatures shown by taking cooling curves. The difference between the practical and the observed temperatures is greater in the case of Ar1 than in that of the other critical points.

1. *Carbon Steel Castings Containing 0.50 Per Cent. of Carbon or Less.*—Heat to 1000 degrees C. (1832 degrees F.) for 12 hr. and cool slowly. The temperature should not at any time rise above 1050 degrees C. (1922 degrees F.).

2. *Rolled and Hammered Steel.*—To relieve stress, the effects of cold or cool working, &c., heat to slightly above the absorption point (Ac1, about 730 degrees C. [1346 degrees F.]), and cool slowly. The absorption point may be recognized easily, because as the temperature rises past it the rate of rise is momentarily lessened—i. e., the rise itself is slightly retarded spontaneously, and may even be wholly arrested. If the reduction in rolling or hammering has been great enough, so that the coarsening of the grain at the high temperature to which the steel had been heated prior to such rolling or hammering has been well effaced, then carrying the heating for this annealing operation far above the absorption point not only is not beneficial, but is even slightly harmful, and the harm increases with the distance above the absorption point to which the temperature is raised, and also with the percentage of carbon. In other words, heating needlessly far above the absorption point is much more hurtful to high carbon than to low carbon steel.

3. *To Remedy the Effects of Overheating,* as, for instance, when the metal has for any reason been allowed to cool from a temperature far above the recalcence point, Ar1, without simultaneously undergoing substantial reduction of area by rolling, hammering or equivalent treatment preventive of harm. In order to remove the effects of such undisturbed cooling from an unduly high temperature, the steel should be reheated to slightly above Ac3, and cooled slowly. To raise the temperature far above Ac3 tends to undo the good done by heating to just above Ac3. If the steel has been overheated very highly or for a very long time, then the length of time during which it must be held above Ac3 should be increased proportionally. This is better than to carry the reheating to a still higher temperature.

4. *How to Recognize the Temperature Ac3.*—When the carbon content is between 0.45 and 0.90 per cent., Ac3 is the temperature at which the steel loses its magnetism. In steels with carbon content less than 0.45 per cent., Ac3 is above the temperature of the loss of the magnetism. For those steels Ac3 can be calculated roughly by the formula:

$$\begin{aligned} \text{Ac3} &= 900^\circ - C \times 200^\circ \text{ in Centigrade degrees.} \\ &= 1652^\circ - C \times 360^\circ \text{ in Fahrenheit degrees.} \end{aligned}$$

In this formula C is the percentage of carbon in the steel. For instance, if the carbon content is 0.30 per cent., then $Ac3$ is about $900^\circ - 200^\circ \times 0.30 = 840^\circ C.$, or $1652^\circ - 360^\circ \times 0.30 = 1544^\circ F.$ This formula, indeed, applies also to steel with between 0.45 and 0.90 per cent. of carbon.

5. *Condensed List of the Critical Temperatures Referred to:*

The recalcence, or A_{r1} , about 700 degrees C. (1292 degrees F.) independently of the carbon content.

The absorption point, or A_{c1} , about 730 degrees C. (1346 degrees F.) independently of the carbon content.

$Ac3$. For steel containing less than 0.90 per cent. of carbon, $Ac3$ can be calculated roughly by the formula:

$$Ac3 = 900^\circ - C \times 200^\circ \text{ in Centigrade degrees.} \\ = 1652^\circ - C \times 360^\circ \text{ in Fahrenheit degrees.}$$

in which C = the percentage of carbon. In case of steels containing between 0.45 and 0.90 per cent. of carbon, $Ac3$ corresponds to the loss of magnetism on heating.

Standard Specifications for Cold-Drawn Steel.

For Committee V, on Standard Specifications for Cold Drawn Steel, the chairman, C. E. Skinner, East Pittsburgh, Pa., presented a progress report. The committee decided to restrict its work for the present to material which would come under the following definition: "Cold drawn steel—bars, either cold drawn or cold rolled to finished size from hot rolled steel." The four classes to be taken up are standard axle, shafting, machinery and automatic screw stock. It has been decided to carry out a series of tests to determine some of the features affecting the working qualities and physical characteristics of standard automatic screw stock.

Standard Specifications for Coal.

J. A. Holmes, chairman of Committee O, on Standard Specifications for Coal, gave an outline of the work of this committee thus far. The committee consists of 60 representatives of the coal mining and engineering interests, and what has been done thus far is chiefly to determine the lines on which the investigation is to be carried on and to appoint subcommittees. Many questions relating to the use of fuel are to be gone into by these subcommittees and so thorough-going an inquiry promises results of much value. The preliminary report of the committee has not been submitted to all the members in view of the number absent from the meeting at which it was prepared.

The relation of the question of conservation of coal to the work of the committee was pointed out. Captain Hunt expressed his gratification at one line of investigation which is to be pursued by the committee—namely, that which relates to the use of coal in power plants in large office buildings. In Chicago some of the most expensive office buildings have made utterly inadequate provision for power plants. The result is that it is absolutely impossible without the expenditure of a great amount of money to put in anything like an adequate power plant.

Dr. Dudley spoke of the questions coming before the Coal Committee as of far reaching importance. On the side of conservation we want everything it is possible to take out of the ground and use as fuel; on the other side is the interest of the consumer. In the case of fast trains on trunk lines, if the locomotive does not secure the very best coal it cannot make its time and that means an increased cost of transportation. An important suggestion in the report of the committee was that poorer grades of coal that will not stand transportation costs must be used nearer the mines.

Standard Specifications for Cast Iron.

Walter Wood, chairman of Committee B, on Standard Specifications for Cast Iron and Finished Castings, reported the committee's proposed standard specifications for buying foundry pig iron, embodying the scheme of analysis and symbols already adopted by the American Foundrymen's Association, with which the committee has co-operated in preparing the specifications. They were published in *The Iron Age* of May 27, page 1687. Mr. Wood asked that the specifications be submitted to letter ballot at once, so that if adopted they might be presented at the International Congress at Copenhagen in September. A resolution was passed for a letter ballot on the specifications as soon as they had received the approval of every member of the committee.

Standard Methods of Testing.

The chairman, Gaetano Lanza, submitted a report for Committee K, on Standard Methods of Testing, covering tensile tests, speed of testing, calibration of testing machines, &c. The report under the society's rules goes over for one year and can then be submitted to letter ballot.

TESTS OF STEEL BEAMS.

Comparison of Standard and Bethlehem Shapes.

A feature of the meeting about which no little interest centered was the paper of Edgar Marburg, professor of civil engineering, University of Pennsylvania, on "Tests of Standard I-Beams and Bethlehem Special I-Beams and Girder Beams." It was quite voluminous and included many tables, diagrams and reproductions of photographs. Space is not available for all these, but the introductory portions of the paper are given and a synopsis of the results of the tests, with the conclusions, or rather suggestions, of the author. The programme as originally outlined was not completed, it will be seen, and Professor Marburg emphasizes the desirability of more tests to throw light on a number of questions. In describing the Bethlehem beams, stating the claims made for them and the conditions of the tests, the paper says:

The new Bethlehem special I-beams and girder beams, rolled on the Grey universal beam mill, at the works of the Bethlehem Steel Company, South Bethlehem, Pa., differ in certain important particulars from the so-called "standard" beams. In the Grey mill the flanges and web of the beam are formed by the simultaneous operation of independent horizontal and vertical rolls, thus admitting of the effective rolling of the metal in the flanges as well as the web. This renders it possible to produce wider flanges than by beam mills of the ordinary type, in which the linear speed of rolling at different points of the beam varies inversely with the distance from the center of the roll, resulting in a dragging action upon the flange metal, which becomes emphasized with increasing flange width. It is claimed that sections produced by the Grey process are also subjected to uniform reduction in rolling at all parts of the shape, resulting in greater uniformity in the physical properties of the material throughout the section, and in the avoidance of internal stresses, and that, in consequence, under nominally the same working stresses, they possess a larger safety margin than beams made by the usual method. It is further claimed that the webs of the standard beams are unnecessarily thick for economy, but that it is not practicable to reduce their thickness in the ordinary mill. Compared with the lightest standard beams of like depth, the lightest Bethlehem special I-beams are designed so as to possess the same section moduli as weights uniformly 10 per cent. less. This is effected by a material decrease of web section and a slight increase of flange section, the comparison for the lightest 24 and 15 in. beams being approximately as follows:

	24-in. beams.		15-in. beams.	
	Std. 80 lb.	Beth. 72 lb.	Std. 42 lb.	Beth. 38 lb.
	sq. in.	sq. in.	sq. in.	sq. in.
Web section.....	10.9	8.1	5.5	3.8
Flange section.....	12.4	13.1	7.0	7.4
Totals.....	23.3	21.2	12.5	11.2

By adding one-sixth of the metal deducted from the web to each flange, the section modulus would remain unchanged, provided the depth between centers of gravity of the flanges is unaffected. Since the flanges of the Bethlehem beams are wider and thinner, however, than those of the standard beams, the flange metal in the former is more favorably disposed; hence the increase of each flange area, for equal section modulus, will be slightly less than one-sixth the area taken from the web as seen from an analysis of the values in the above table. The slope of the flanges of the Bethlehem beams is one-fourth less than that of the standard beams, or 1 on 8, instead of 1 on 6.

The Bethlehem girder beams are so designed that the lightest section of a given depth possesses just twice the section modulus of the lightest standard beam of corresponding depth, whereas the weight of the former averages about 12.5 per cent. less than the double weight of the latter. The web thicknesses are practically identical, the difference lying chiefly in the greatly increased width and slightly increased thickness of the flanges. For the greatest depth of section of standard beams, 24 in., the section modulus of the lightest girder beam is somewhat less than twice that of the lightest standard beam.

The largest Bethlehem girder beam is 30 in. deep and weighs 200 lb. per foot; the largest standard beam is 24 in. deep and weighs 100 lb. per foot. The section moduli are 610 and 198, respectively, the former being more than three times as great as the latter, although the weight is only twice as great, this advantage being, of course, due partly to the difference in depth and partly to the more favorable distrib-

ution of the material between the web and flanges. The claims advanced in favor of the Bethlehem as compared with the standard beams, briefly summarized, are:

1. That the material in the flanges receives more work in rolling, and is, therefore, of better quality.
2. That the material throughout the section is more nearly uniform in quality.
3. That the beams are comparatively free from internal stresses.

If these claims are valid, it obviously follows that the Bethlehem beams are stronger for like section moduli, provided the relatively thin webs do not induce premature failure by buckling.

In view of the importance of the subject to the engineering profession, and the desirability of determining by actual tests the validity of the above claims, the writer proposed to the Bethlehem Steel Company to conduct at the expense of that company, in the laboratories of the Department of Civil Engineering, University of Pennsylvania, an extended series of comparative tests between Bethlehem and standard beams, reserving to himself only the right of publication. This proposal was accepted, and a programme of tests was accordingly drawn up by the author in conference with George H. Blakeley, structural engineer of the Bethlehem Steel Company. This programme was regarded at the time as a preliminary one to be further elaborated or modified in the light of experience. In that expectation the writer was disappointed, since even the material for the completion of the programme originally agreed upon had not been wholly supplied when the tests came to an unexpected termination last December. If the results of these tests, which are all embodied in this paper, point conclusively to one thing, it is the importance of continuing these investigations on greatly extended lines.

The preliminary programme embraced 33 beams, ranging from 15-in. sections weighing 38 lb. per foot to 30-in. sections weighing 175 lb. per foot. The total weight of material was about 25 tons. The beams were in every case the lightest sections of their respective types and depths. There were six 15-in. Bethlehem I-beams, 38 lb. per foot; six 15-in. standard beams, 42 lb. per foot; six 15-in. Bethlehem girders, 73 lb. per foot; three 24-in. Bethlehem I-beams, 72 lb. per foot; three 24-in. standard beams, 80 lb. per foot; three 24-in. Bethlehem girders, 120 lb. per foot; three 30-in. Bethlehem I-beams, 10 lb. per foot, and three 30-in. Bethlehem girders, 175 lb. per foot. The Bethlehem beams were selected at random from given heats. The standard beams were purchased by the Bethlehem Steel Company. The carbon ranged from 0.18 to 0.26 and the manganese from 0.41 to 0.85 per cent., while the percentages of phosphorus and sulphur averaged about 0.02 and 0.04, respectively.

TENSILE TESTS AND BENDING TESTS.

A portion of the author's comment on the tensile and bending tests is as follows:

Three tensile tests were to be made on specimens cut from the beams from each heat of steel, one specimen to be taken from the web, another from the flange, and a third from the root. This programme was not fully carried out for reasons noted. The most notable feature of the tables of elastic limit, ultimate strength, &c., are the remarkably low values of the elastic limit in five of the seven specimens from the root, particularly in the case of the Bethlehem 15-in. girder beams, for which the elastic limit at the root was only 11,000 lb. In six of the seven sets of specimens the elastic limit was highest in the web, as was to be anticipated, and in the seventh set the flange specimen gave a slightly higher value. The abnormal character of the material in the specimens which displayed such low elastic limits is further apparent from the fact that the ratio of the yield point to the elastic limit is, in these cases, much higher than in properly finished structural steel. This is clearly apparent in the stress deformation curves, in which the highest point on each curve usually represents the yield point. It is obvious, therefore, that the determination of the yield point by the drop of the scale beam gives, under such circumstances, not even approximate information as to the value of the true elastic limit. The recorded values of the elastic limit for the 15-in. Bethlehem beams are probably somewhat too low by reason of the relatively large increments of loading between successive readings. Had such remarkably low values been anticipated, the critical region would, of course, have been approached more cautiously. It is noteworthy that certain specimens which exhibit decidedly low elastic limits run particularly high in ultimate strength.

Unfortunately this inferior material exists at the root or thickest part of the flange where its effect on the strength of the beam is greatest. For fuller information as to the variability of the metal it would be desirable to cut the entire section longitudinally into a series of thin strips of suitable length. By taking accurate extensometer measurements be-

tween a pair of contact points on each strip, before and after it is separated from the beam, its state of initial stress may be determined. While there seems to be some justification for the claim that Bethlehem beams possess greater freedom from initial stresses than standard beams, experimental proof is needed for its actual demonstration.

The following are the most important deductions from the tables of bending tests:

1. That the elastic limit of the standard beams is very nearly constant, the average value lying slightly above 20,000 lb.
2. That the elastic limit of the Bethlehem special I-beams is much lower for quarter point than for central loading, and that this is true also, though in a less degree, of the girder beams. A partial explanation may, perhaps, be found in the fact that, with the former loading, the maximum fiber stress is developed throughout the middle half of the beam instead of at the central section only, although this applies equally to the standard beams, which exhibit no such difference in their behavior.
3. That the elastic limit of the 15-in. Bethlehem beams is much higher than that of the 15-in. standard beams, under central loading, and slightly higher under quarter point loading.
4. That the elastic limit of the Bethlehem beams declines very rapidly for the larger sections, reaching finally the remarkably low value of 10,800 lb. for the 30-in. girder beam G 32, the values for the other two beams of that set being only slightly higher.

The writer will not hazard an explanation as to the cause of these remarkably low values of the elastic limit, but he desires to express his conviction that if the beams tested are fairly representative samples, the use of a working fiber stress of 16,000 lb. per square inch, as usually recommended for buildings, is indefensible. It is essential, in his judgment, that the investigation of this phase of the subject should be greatly extended.

The values of the modulus of rupture in the case of the standard beams exhibit considerable variations, whereas the elastic limits are nearly constant. The Bethlehem 30-in. beams again give the lowest values, beam G 31 having a modulus of only 27,400 lb. It may reasonably be anticipated that the modulus of rupture, unlike the elastic limit, is influenced in a no inconsiderable measure by the degree of fixedness of ends and by the lateral support of the compression flange at intermediate points. The values given should, therefore, be regarded as relative rather than absolute.

The modulus of elasticity in bending is nearly constant, its average value for the 31 beams tested being 26,300,000. The average modulus from the tensile tests, after rejecting the value 35,000,000 for the abnormal specimen from the root of the 15-in., 73-lb. Bethlehem girder, is 28,700,000 or nearly 10 per cent. higher than the modulus in bending, this difference being in general agreement with observations of a similar nature by other investigators.

MANNER OF FAILURE.

The principal manner of failure of each beam is described. The standard beams failed in every instance by what is described as "lateral deflection of top flange," and the Bethlehem special I-beams by what is designated "twist of web." Manifestly any lateral movement of the flange is accompanied by a like movement of the web. The distinction in the two forms of designation is made, however, because in the case of the standard beam the initial cause of failure seemed to be the lateral weakness of the compression flange; that is to say, while the flange would deflect laterally near the center, the verticality of the web at the ends would be well maintained, unless the bending of the beams was continued, under rapidly decreasing loading, far beyond the point at which the load had reached its maximum value. The failure of the Bethlehem special I-beams was, on the contrary, generally speaking, marked by a sudden and considerable twisting of the web—usually in opposite directions at opposite ends, the beam, as a whole, assuming the form of a very flat letter S—the flanges remaining comparatively straight.

The characteristic failure of the 15 and 24 in. Bethlehem girder beams, under quarter point loading, was by the lateral deflection of the upper flange, in a manner very similar to that of the standard beams. Owing to the greater width of flange in these beams, this deflection, once begun, did not increase as rapidly as in the case of standard beams. The 30-in. Bethlehem girder beams failed by the twisting of the web. The 15-in. girder beams, centrally loaded, failed, on the contrary, by the wavy buckling of the outstanding edges, vertically, in the vicinity of the center, the metal being apparently too thin to bring about failure through the lateral deflection of the compression flange. When this form of failure began to manifest itself there was no evidence of any lateral deflection of the flange as a whole.

In general it may be said that there was in no instance any evidence of the buckling of the web in detail vertically, not even at the points of loading and support. The web in twisting assumed the curvature of a warped surface; that

is to say, its originally vertical elements became inclined, but remained straight, or grew very slightly curved.

CONCLUSIONS.

The number of tests is not sufficient to warrant definite conclusions. They do point out the need, however, of greatly extended investigations along these and similar lines, with a view of throwing more light on the following points in particular:

1. The low elastic limit of the metal near the root of the flange: its cause and prevention.
2. The low elastic limits in bending for the deeper beams: the cause and prevention, unless it can be proven conclusively that the values obtained in the present series are abnormal.
3. The effect, both on the elastic limit in bending and modulus of rupture, of variations in the supports and lateral restraint at the ends and intermediate points.
4. Extensive tests on the crippling strength of thin webs.
5. An experimental inquiry relative to the existence and magnitude of internal stresses, and how these are affected by different methods of rolling, finishing temperature, &c.

DISCUSSION.

In the discussion of Professor Marburg's paper reference was made to the strains set up in structural shapes in rolling due to the greater speed of the portion of the rolls acting upon the web of the piece. Strains thus produced are likely to be permanent. Other strains result from unequal cooling of the relatively thin web and the heavier flange. Reference was made to the possibility of some of these strains being relieved by allowing some months to elapse between the rolling and the placing of the material in service. One speaker, referring to the general belief that a beam rolled in a universal mill would be freer from strain than one which had been acted upon by horizontal rolls only, expressed surprise at the evidence in the paper to the contrary. However, the short interval between the rolling and the testing, it was granted, should be taken into account.

The question came up why the investigation was limited to beams of 15-in. width and over, whereas sections under 15 in. are more commonly used. Professor Marburg explained that as the greater part of the output of Bethlehem sections is in the larger sizes, these were selected for test as being more representative of the performance of the Grey shapes. Another point made by one of the speakers was that the tests described in the paper are not representative of service conditions, since the lateral supports found in service were absent. Professor Marburg answered that no lateral deflection was noticed in the beams tested until after the elastic limit had been exceeded.

FAILURES OF STEEL IN SERVICE.

Further Investigations of Broken Steel Rails.

A paper describing studies of broken steel rails carried on at the Massachusetts Institute of Technology by Henry Fay and R. W. G. Wint was read by the former. It detailed the discoveries made in the past year bearing out what Dr. Fay showed at the previous meeting of the part played by manganese sulphide in causing rail failures. It was found in the rails examined that cracks always started in the manganese sulphide before they are produced in the metal. Silicate of manganese was also a contributing cause; it had been found more abundant in the bottom than in the top portions of the ingot, while the sulphide is more common at the top. Lantern slides were presented showing magnified etched specimens from broken rails. One of the failures studied was of a split rail from the Burlington road. Slag pits were plentiful and both sulphide and silicate of manganese were found. The speaker said that the investigations of the year had confirmed the statements he had previously made as to the responsibility of manganese sulphide for crescent shaped breaks in rails. He suggested that specifications should call for lower sulphur; that more time be allowed between the manganese additions and the pouring of ingots; that ingots be bottom poured; and that there be more refining of the metal, by the employment of the electric furnace or otherwise.

DISCUSSION.

The view was expressed in the discussion on Dr. Fay's paper and that of Robert Job, referred to below,

that the use of the microscope gives exaggerated impressions concerning the effect of unimportant flaws. Professor Howe called attention to the pitted appearance of one sample shown on the screen and said that if the steel contained as much slag as the etched and magnified specimen indicated the rail would have been rejected for being plainly under weight. He suggested that in mirror polishing of steel so-called pits are found that do not explain themselves, and that may really be remains of old file marks. Mr. Bostwick said that in the Carnegie Steel Company's experience, where abnormally large percentages of sulphur and manganese had been deliberately used in steel for certain purposes, there had been none of the manganese sulphide phenomena which Dr. Fay had emphasized. Another speaker made the point that microscopic investigations often disclose the thing for which the investigator is hunting.

Dr. Dudley said he could not fully agree with either side in the steel rail controversy. There are unsolved problems that need careful investigation. As to sulphide and silicate of manganese, it may be said that if a rail contains them it is quite sure to break. He believed it in the power of the steel maker to make better steel. A longer time between the additions of manganese and the pouring will relieve some of the troubles reported. The electric furnace may do something. For the railroad the question is whether to spend more money on better steel rails or to put more money in draining sub-grades and in giving the rail better support in track. It is well known that inferior steel, if properly supported, will do the work required, and he had gone so far as to say that if he were allowed to spend enough money to support cast iron rails properly he could send a train from New York to Chicago on a cast iron track. The problem of the railroads is where the balance lies between spending money on track maintenance and putting more money into rails. As bearing on the question of rail support it was stated that very few crescent shaped breaks were found on bridges. E. F. Kenney said that over 90 per cent. of the crescent shaped breaks reported on the Pennsylvania Railroad occurred over the tie bearing.

Defective Open Hearth Steel Rails.

Robert Job, Philadelphia, read a paper illustrated by slides, on an "Investigation of Defective Open Hearth Steel Rails." We make the following extracts:

During the past few years the proportion of open hearth rails rolled has increased rapidly, owing to the fact that by cutting down the phosphorus to a minimum a great increase in toughness results, rendering possible a much higher carbon content than is safe in a high phosphorus Bessemer rail, and hence a higher elastic limit, with increased hardness and capacity for wear. With good mill practice very favorable service results may be obtained, but we have known of instances in which such rails have averaged only one-third the wear found with the usual Bessemer rails when laid in track end to end with the others and under exactly the same conditions of service.

As has been pointed out repeatedly, the name "open hearth" is no talisman for production of rails certain to give good service, and it is well known that rails of this method of manufacture are subject to the same general defects which may be found in Bessemer rails, and hence require equal care during the process of manufacture.

In the study of causes of failure of rails, striking instances occasionally occur which are of especial interest in view of the results in service. An example of this type was furnished not long ago. An open hearth rail had broken in service into about 40 pieces, derailling a train, but fortunately causing no loss of life. A critical examination was made to determine the exact cause of the failure. In the preliminary investigation we found that a blowhole began near the receiving end of the rail, about $\frac{1}{2}$ in. below the top of the head, parallel with the surface of the latter and extended clear to the running off end of the rail. Within a short distance from the start the unwelded seam spread from one side of the head to the other, with oxidized surfaces. In the unbroken rail no defect could have been visible, and even after the fracture the only sign of defective condition upon the contour of the unbroken pieces was a faint line like a roll mark along the side of the head, generally covered with mill scale. When the fracture came evidently the $\frac{1}{2}$ -in. layer upon the top of the head cracked, throwing the end against the opposing wheels, and thus causing the derailment, the remainder of the rail being ground into pieces by the force of the impact and the pounding of the wheels.

In order to study the condition of the steel a transverse section was cut at a point about 3 ft. from the receiving end of the rail, and an analysis made of the borings taken with a $\frac{5}{8}$ -in. drill about $\frac{1}{2}$ in. below the top of the web showed the following composition:

	Per cent.		Per cent.
Carbon	1.070	Manganese	0.758
Phosphorus	0.031	Sulphur	0.025

The heat average was about as follows:

	Per cent.		Per cent.
Carbon	0.75	Manganese	0.76
Phosphorus	0.030	Sulphur	0.05

In order to note the extent of segregation in the section, borings were taken with the $\frac{5}{8}$ -in. drill about $\frac{1}{2}$ in. to the side of the center of head at a distance of $1\frac{1}{2}$ in. from the location of the first borings, and the following composition was found:

	Per cent.
Carbon	0.918
Phosphorus	0.027

From the above it is clear that radical segregation of the ingot existed and accounted for a decided difference in the physical properties of the steel in closely adjacent places. The granular structure of the steel was about normal, showing that burning or overheating had not occurred.

As the next step in developing the physical character of the metal we polished the surface of the section and found that the steel contained a large number of porous spongy spots in the web, while a blowhole extended transversely across the head. Upon etching the steel slightly with alcoholic iodine we found additional indication of the unsound condition of the steel, proving that the defects were not local, but extended throughout the section. The fracture was unquestionably caused by the large blowhole across the head, but even though this had not been present short life would have been certain to result, owing to the general condition of unsoundness, for the fact has been demonstrated so often that it has become an axiom that good service cannot be expected from an unsound rail.

In many cases of unsoundness the general location and character of the defect is indicated by the service which is given and the manner in which the rail begins to fail. When great porosity exists, or when much slag and other matter is present, slivering generally follows after a short life, and the steel upon the outside edge of the head begins to flow, and ultimately sloughs off, and is called "soft steel" by the track men, although this action gives no indication of the carbon contents; it is simply a consequence of unsoundness. We have found that the service suffers severely when unsoundness exists near the upper portion of the head, and fracture may occur or slivering and mashing down. When the same defects are somewhat below the surface, leaving a layer of sound steel $\frac{1}{4}$ in. or so in width, good service often results until the sound metal has worn away.

An Axle Failure.

In connection with the paper of Max H. Wickhorst, engineer of tests of the Chicago, Burlington & Quincy Railroad, as printed elsewhere, the writer raised the question whether a steel billet of coarse crystalline structure, such as was shown in the broken axle he described, could be so treated that a good forged or rolled product could be made from it. J. J. Shuman, Pittsburgh, pointed out that a billet is not a finished product and that the steel manufacturer cannot be held responsible for the results of operations subsequent to the making of the billet. The question of temperature is not given much attention in the blooming mill; indeed, it is not possible to finish a bloom at a temperature low enough to give a fine structure at its center.

MECHANICAL TREATMENT OF STEEL.

Closing Cavities in Ingots.

Professor Howe presented the results of an investigation into the "Closing up of Blowholes in Steel Ingots." He said it had been contended that the gases causing blowholes are held in hermetically sealed cavities. His inquiry was conducted to ascertain whether these cavities can be closed. Slabs were cut from an ingot, one near the top, a second from the middle and the third near the bottom, in each case penetrating the ingot about half way. The slab from the top showed that the blowholes were small and occurred near the surface. The slab from the middle of the ingot showed larger and more pronounced blowholes, generally limited to a particular area. In the lower slab the cavities were quite large. The ingot from which the slabs were cut was rolled into a plate 50 in. wide, $\frac{1}{2}$ in. thick and 150 in. long. Comparisons of the specific gravity of the steel in the slabs and the steel in the plate were made. Specimens from

the spongy part of the former showed an average specific gravity of 6.58, as compared with 7.8 for the spongy portion of the plate. A specimen cut from the more compact part of the slab showed a specific gravity of 7.83, while the specific gravity of the plate rolled from the more compact part was 7.9. Comparisons made between the spongy and compact portions of the middle and bottom slabs, in which blowholes were more pronounced, are interesting when taken in connection with comparisons between the more spongy and the more compact parts of the plates. In the case of the unrolled steel from the middle portion of the ingot the compact part exceeded the spongy part in density by 10 per cent.; in the plate from the corresponding middle portion the difference was but 0.2 per cent. With the bottom portion of the ingot the density of the compact steel was 16 per cent. more than that of the spongy steel, whereas specimens taken from corresponding portions of the plate showed practically uniform specific gravity. The indications are, therefore, that the blowholes are pretty well closed up and that the gas filling the cavities in the ingot has escaped. Examples were cited of the ease with which gases pass from heated masses of iron. In the pickling of wire, in which it is subjected to a mild heat, hydrogen passes out without any pressure and in the soaking pit nitrogen is rapidly given off from the ingot. Similarly gases may pass out of the blowholes in steel. The speaker finally raised the question, Granting that the gases have escaped, are the holes welded? and answered that there is good reason to believe that they are.

DISCUSSION.

Dr. Dudley referred to the requirement in connection with the bending test for boiler steel that if on breaking a cavity more than $\frac{1}{4}$ in. in length is shown the steel shall be rejected. He was of opinion that not all cavities are closed in rolling.

Capt. R. W. Hunt said that while manufacturers of crucible steel hammer their ingots to close blowholes the manufacturer of boiler plates does not take that precaution. A distinction should be made between welded blowholes and cases of occluded scale, for no amount of rolling could eliminate the latter. Another speaker referred to a tool steel plant employing both the crucible and open hearth processes. The open hearth ingots have more blowholes than the crucible steel, but the former are hammered before rolling and with good results.

On behalf of the steel manufacturers the point was brought out that the closing of blowholes is the very purpose of certain mill operations—the heating of the steel to a high temperature and the heavy first drafts in the rolls. It was said to be the common experience that blowholes free from oxide are welded in rolling. Dr. J. A. Mathews said that in his experience the welding of tool steel ingots is unusual practice. Seams and pipes, it was stated, are the least of the troubles encountered with such steel, the ingots being free from cavities of any kind. James Christle spoke of honeycombs in steel as formerly quite common. In England in the early '60s many ingots were not cogged, but were compressed in hydraulic presses. The finished product was entirely solid and rails rolled from such steel lasted in service until recent years. At the Pencoyd Works years ago a 20-ton hammer was set up for the forging of ingots, and the product from steel so treated was free from porosity. With the coming in of the blooming mill came troubles from cavities in the steel, indicating that the method of compression Bessemer used was sufficient to close blowholes and to give the steel of that day its superior wearing quality.

Fluid Compression of Steel Ingots.

Bradley Stoughton, New York, read a paper discussing with much detail "The Physical Quality of Steel Which Has Been Subjected to Compression During Solidification." He said that admittedly precautions observed during the chemical process of manufacture will greatly lessen the liability to blowholes and segregation; that subsequent discards if sufficiently extensive will remove all or the greater part of some defects, such as segregation and pipes; also that mechanical treatment will usu-

ally remedy, in part at least, external cracks and ingotism. But it is the belief of advocates of liquid compression that occasionally one or more defects may be present in the finished product without the knowledge of manufacturer or consumer, and that careful compression through the period of solidification will prevent some and greatly lessen others. The paper in its earlier portions discusses the testimony as to the efficacy of fluid compression to improve steel ingots in the following ways: By lessening the size of blowholes if it does not prevent them altogether; by completely closing up pipes; by lifting portions containing segregates into the upper part of the ingot which is cropped; by lessening the liability to the surface cracks which develop into flaws in the finished material. The author has thus brought together for the first time all the available data of tests which have led to the diverse views among steel makers as to the alleged superior physical properties of compressed steel.

The tensile tests cited of compressed and uncompressed ingots show the ultimate strength of the compressed to be 3 to 39 per cent. greater; the elastic limit 1 to 12 per cent. better; the elongation from 51 to 125 per cent. better, and the reduction of area from 60 to 94 per cent. better. However, a nickel steel ingot compressed by the Harmet process and tested at Watertown Arsenal did not show well for liquid compression. Though compressed 5 hr. 18 min., the ingot contained structural defects and lines of unsoundness. The lines of structural unsoundness developed into open cracks in the tension tests, under comparatively early loads and located the place of final rupture. It may be that the compression operation was improperly applied to this ingot, or that the metal was very wild, owing to faulty manufacture, and hence it may be concluded that liquid compression is not capable of curing such an extreme case of unsoundness.

The really important question whether the mechanical treatment of steel in forging or rolling cures the ingot defects mentioned as thoroughly as the combination of ingot compression and the subsequent mechanical treatment of the rolling mill or forge was considered by the author at some length. Some tests of blooms were rather favorable to compression. Tests of bars and angle irons showed higher tensile strength for compressed steel, but elongation was lower for compressed than uncompressed steel where there was no annealing. After annealing the elongation of the compressed steel was materially higher than that of the uncompressed annealed steel. The homogeneity of forged steel from compressed ingots is much better in the tests shown than that of forged steel from uncompressed ingots. In conclusion, the paper says:

Compression during solidification lessens the liability of steel to contain the remnants of pipes, blowholes, segregation and external cracks, and partially prevents the development of a weak structure during crystallization. So far as is shown by the tests we have been able to find, it also slightly increases the strength of finished steel and increases its toughness under impact, besides making the different parts of ingots more uniform in quality both before and after rolling. There are at least 18 plants in England and Europe equipped with a total of 3 to 40 presses, and at least three or four plants, so far as we are informed, with about an equal number of presses in America.

DISCUSSION.

Professor Howe in opening the discussion referred to the difference between the Harmet process, which by driving a tapered ingot through a tapered mold secured a compressive action on all portions of the ingot, and the Whitworth process, in which the compression of a cylindrical ingot at the ends tends to force the segregate to the outer portions on the sides. The important question to consider is whether fluid compression improves the quality of the metal over and above the closing of blowholes and the lessening of segregation by the lifting of the segregate. Is there any merit in this forging operation which takes place at a temperature higher than that of ordinary forging or rolling? The conclusion from Mr. Howard's experiments is that the Harmet process gives the best steel in the outer portions of the piece, where rolling is also most effective. Referring to Harmet's published results the speaker said that they

are largely based on samples taken at the axis of the ingot, where compression would be expected to show the greatest improvement. Tests of finished steel forged or rolled from compressed ingots, as reported by Harmet, showed an enormously high elastic ratio, suggesting that the steel may have been finished at lower temperatures than material from ordinary ingots with which comparisons were made. Similarly the impact tests give evidences of colder finishing of the steel from compressed ingots than of that from ordinary ingots. The question is thus raised whether the superiority indicated for the fluid compressed steel is not due to treatment subsequent to the compression.

PRESERVATIVE COATINGS AND CORROSION.

Wm. H. Walker, Massachusetts Institute of Technology, Boston, presented the report of Committee U, on

The Corrosion of Iron and Steel

in the absence of Allerton S. Cushman, chairman. A vast amount of work has been done by the committee in the past year. Part of this has been in co-operation with the American Steel & Wire Company and the Paint Manufacturers' Association of the United States. Twelve samples of galvanized steel wire were manufactured by the American Steel & Wire Company, and these have been erected in the form of test fences and exposed to the action of the weather on the grounds of the Carnegie Technical School at Pittsburgh. The 12 samples were divided into three groups. The first was a wire of the following composition:

	Per cent.		Per cent.
Carbon	0.66	Sulphur	0.028
Manganese	0.84	Phosphorus	0.016

This was made at the Newburgh Steel Works, Cleveland, by the basic open hearth method. In galvanizing the wire was not wiped, thus retaining as much zinc as would adhere to it. The purpose was to test this high carbon wire against low carbon, low manganese wires which composed Groups 2 and 3. The second group consisted of six samples of American style eight-strand fabricated fencing 45 in. high. The steel was made by the Bessemer process, and six billets were taken representing the top, the middle and the bottom of the first and last ingots of the heat. The object of this group was to determine the effect, if any, of segregation of the impurities in the steel. The analysis of the heat was as follows:

	Per cent.		Per cent.
Carbon	0.09	Sulphur	0.045
Manganese	0.55	Phosphorus	0.092

The third group consisted of five samples of basic open hearth steel, showing the following amounts of manganese, respectively: 0.07, 0.12, 0.16, 0.24 and 0.37 per cent. The carbons ranged from 0.04 to 0.06 per cent. and the sulphur and phosphorus from 0.010 to 0.018 per cent. The fencing made from the above wires was put up in September, 1908. An examination made recently showed that there was practically no difference in the corrosion of the various samples, though really none was expected in so short a time. The committee referred in the concluding portion of its report to the accelerated acid test given in its report of 1907. This had been misinterpreted by some as the standard method proposed by the committee. It was merely the intention of the committee, however, that those who cared to make such an acid test should use certain uniform conditions as to concentration of acid, size of specimen, time of immersion, &c., so that the results obtained might be comparable and thereby ultimately determine whether the results of such a test bear any relation to corrosion as observed in service. The results so far obtained show that the test is not generally applicable and in some cases may be very misleading.

DISCUSSION.

In the discussion of the report, the meeting drifted into one of those attempts to compare the resistance to corrosion shown by puddled iron and steel in service, which have been witnessed at some stage of every convention of the society. The issue was raised by some remarks of J. P. Snow, of the Boston & Maine Railroad, who showed some metal from a signal tower on that

road which had been scrapped after 10 years' use. Wrought iron and steel had been used in conjunction, he said, and while the puddled iron stood up well, some of the steel was badly rust eaten. In another case steel hoops on water tanks had been eaten through in three years, while some puddled iron hoops have been in service 30 years.

Mr. Walker pointed out that where iron and steel, with their differences of electric potential, are used together the material of low potential gives way first under corrosion. The fair test of resistance is where but one kind of material is made use of in a given structure. He had gathered data from which a convincing brief could be written on the superiority of steel; on the other hand, an equally convincing presentation could be made for iron. Good iron will resist corrosion; so also will good steel. Poor iron and poor steel will show poor resistance.

F. N. Speller, National Tube Company, said that while short time tests were sometimes spoken of as not conclusive, his company had made tests which by acceleration of service effects were able to show in two years the corrosion ordinarily produced in 15 or 20 years in service. Such tests had given important data as to the good wearing qualities of steel in comparison with iron. In Panama about 500 samples of pipe used by the French canal builders had been secured. In 20 or 30 cases iron and steel had been exposed together under the same conditions. The steel dated back 20 years ago, when methods of manufacture were not calculated to give a good material as those of to-day. Yet in not one of the comparisons made of this Panama canal piping were the results such as to reflect on the steel. In practice tests, such as Mr. Snow had reported, it is so easy to make a mistake as between iron and steel, that it is best to make analyses. Dr. Dudley confirmed this last statement by saying that in former days when fracture was relied on for the differentiation of iron and steel, the sample was put in a vise. If the vise was screwed up tight and the piece hit several moderate blows the fracture would be fibrous; if it was broken with a sharp blow a crystalline structure would be shown.

Preservative Coatings for Iron and Steel.

Chairman Voorhees, in reporting on the work of Committee E, on Preservative Coatings for Iron and Steel, said that the paint tests heretofore described have been followed further in the past year. At the Havre de Grace, Md., bridge it was found that the paints on both the panels and the bridge proper are affording excellent protection after a little more than 2½ years' exposure. Another year should permit of definite conclusions in many respects. There is little actual disintegration as yet, but some differentiation can already be made between panels covered with the same coatings at different rates of spreading. It is the intention to have the paint removed from one panel in each set. The condition of the steel under the paint film will be noted with much interest in view of the recent laboratory experiments showing the different actions of different pigments on corrosion. In the case of the wooden panels on the Atlantic City fence, in which Committee E is acting only in an inspecting capacity for the Paint Manufacturers' Association, it has been found that the tinted panels (drab and yellow, through the addition of inert pigments to white paints) are in better condition than the white panels. The pure white lead has chalked more than some and less than others of the composite whites. The panels painted with pure lithopone and composite paints containing as low as 60 per cent. lithopone have failed entirely and have been removed from the fence. An important investigation undertaken in the year looks to the standardizing of tests employed in the examination of linseed oil and a subcommittee on this work has outlined an extensive inquiry. In co-operation with the Committee on Corrosion of Iron and Steel, Committee E has done considerable work, which will be reported on separately. It is hoped that additional service tests with white paints on wooden surfaces can be conducted. The quality of house paints is of such importance to the building interests of the country that the committee's report must be based on positive data.

Tests to Discover Inhibitors of Corrosion.

The work of the joint subcommittees E and U, referred to above, was presented by Wm. H. Walker. In the open market 50 different pigments were bought representing material in ordinary use. They were distributed among various chemists for testing. The tests consisted in putting samples of different kinds of steel into bottles connected together in the same way as a train of wash bottles, equal quantities of the different pigments being inserted in the successive bottles, together with an equal volume of water. Air was then bubbled in for various lengths of time. The previously weighed samples of steel were then removed, cleaned with a brush, dried and reweighed. The condition of the surface and the loss in weight were noted. From results secured by five chemists the pigments were divided into three classes—inhibitors, indeterminates and stimulators. From the 50 pigments, 10 inhibitors and 9 stimulators were selected, the five experimenters being unanimous in so classifying them. Where there was lack of agreement in classification the pigments were set aside for further consideration. To determine the value of these laboratory tests the Paint Manufacturers' Association of the United States agreed to erect at Chelsea, a suburb of Atlantic City, a number of steel plates, covering them with single pigments from the three classes noted above, also with composite pigments, so as to secure a theoretical inhibitor under coat and an excluding final coat, all ground in the same vehicle. The steel plates were rolled from Bessemer steel, basic open hearth steel and a special pure iron. It is yet too early for positive deductions from these tests, but results of great practical value are expected.

Testing of Galvanized Iron and Steel.

Wm. H. Walker read a paper on the "Testing of Galvanized and Other Zinc Coated Iron," using the term iron and including steel. Three methods of coating iron with metallic zinc are now in use, but no method of testing has been proposed except the Preece or copper sulphate immersion test, which was in vogue when only the original or "hot" galvanizing method was employed. Such tests to be of value, according to the speaker, should measure: 1, the uniformity and thickness of the zinc coating; 2, the continuity of the coating with reference to pin holes; 3, the purity of the zinc; 4, the toughness and ductility of the coating. The paper showed that the differences in methods of coating made a test which is effective in one case useless in another, hence more tests than the familiar one are necessary. The point was brought out that the purity of the iron or steel used in the wire itself plays an important part in determining the ultimate durability of a fence, for example, but the thickness of the zinc coating, in the opinion of the author, calls for more attention. The modern method of close mechanical wiping of the wire as it emerges from the zinc bath produces too often a wire covered, not with zinc, but only a thin layer of electro-negative iron-zinc alloy, which affords but little protection. What is needed most is more zinc, and the consumer can well afford to pay for it in view of the present high cost of fence renewals every six or at most eight years. The argument of the paper is thus summarized:

1. That the copper sulphate immersion test is of value in determining the uniformity of coating and relatively the thickness of coating in hot and wet galvanized product; but it is worthless in the case of sherardized products and gives no idea of other important factors involved in the durability of the structure.
2. That by immersing a galvanized product in hot, strong caustic soda, the presence of any unprotected iron may be easily detected, however small such area may be.
3. That the weight of zinc per unit area apart from the iron-zinc alloy may be analytically determined by dissolving the zinc from the plate through treatment in hot caustic soda, while in contact with metallic iron.
4. That theoretically the rate at which hydrogen is evolved when the galvanized product is immersed in dilute acid should indicate its relative durability; that inferior products should reach a maximum in a few minutes compared with a much longer time for better products.
5. That in the very important matter of fencing wire, while the purity of the iron used is of consequence, a more immediate necessity is a heavier coating of zinc on the wire.
6. It is suggested that the flexibility of a zinc coated wire

may possibly be increased by mechanically working the wire in rolls or dies to destroy crystallization in the zinc coating.

OTHER PAPERS.

Edgar A. Custer, president Tacony Iron Company, Philadelphia, gave interesting details of his investigations dealing with the "Permanent Mold and Its Effect on Cast Iron." Most of the data have already appeared in substance in the papers of Mr. Custer heretofore published in *The Iron Age*. He dwelt on the effect of the permanent mold in hardening cast iron, this effect, within the limits of gray iron, being independent of variations in percentages of silicon, phosphorus and sulphur. The casting, after being chilled to the point of solidification, is removed from the metallic mold. "The first chilling brings the molecules to a receptive position. Removing the chilling medium holds this position, and as the temperature falls the molecular position becomes permanent. If at the receptive position the casting be quenched in cold water, the great unmeasurable force of heat expansion and contraction is brought into play. No one knows how many tons pressure per square inch is exerted when molten iron cools. The molecules are crushed together with an enormous pressure and an extremely dense structure results." * * * It is found, the paper shows, that castings made in permanent molds, being instantly cooled to the point of set and then allowed to cool normally, have their carbon in the combined form at setting, but it changes to the free form as cooling progresses. It is not in the graphitic form, however, but partakes more of the character of annealing carbon, as shown in a malleable casting. Mr. Custer said that while plow points, pipe fittings, brake shoes and agricultural castings have been made in permanent molds the latest development is the casting of threads in fittings. He showed a Y in which threads had been cast, these being as uniform and well defined as those cut by machines.

Among papers read by title was one by E. L. Hancock on "The Effect of Tension on the Shearing Strength of Rivet Steel." Three papers by P. H. Dudley were so presented, the subjects being: "Detailed Fractures of Cold Rolled Rails at Low Temperatures," "Elongation and Ductility Tests of Rail Sections Under the Manufacturers' Standard Drop Testing Machine," and "Dark Carbon Streaks in Segregated Metal of 'Split Heads' of Rails." T. Y. Olsen had papers on "A Machine of New Design for Hardness Tests" and "Principal Features of a 1,200,000-lb. Testing Machine with Special Reference to a New System of Transmitting the Pressure Developed in the Hydraulic Cylinder to the Scale Beam."

BUSINESS SESSION.

Dr. C. E. Munroe, Washington, D. C., called the attention of the society to the great desirability of more uniform requirements as to the composition of explosives and the matter was referred to the Executive Committee for the creation of a Committee on Specifications for Explosives, if thought advisable.

The Executive Committee's recommendation was adopted sending the following resolution to letter ballot:

That it is desirable that the testing facilities of the country be increased by a machine of sufficient capacity for testing large structural members; that this project is believed to be eminently deserving of the support of the Federal Government, to the end that such a machine may become available also under suitable restrictions for research tests of materials and structural members with the co-operation of engineers not necessarily connected with the Government service.

International Congress for the United States.

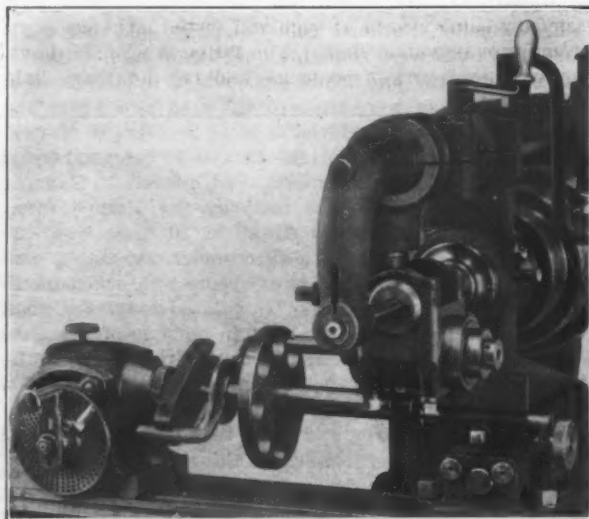
A resolution was passed confirming the action of the Executive Committee in appointing Dr. Charles B. Dudley to represent the society at Copenhagen in September at the congress of the International Association for Testing Materials, and to extend an invitation for the holding of the sixth international congress in the United States in 1912, and expressing the hope that this invitation will be favorably entertained.

A number of members of the American Society for Testing Materials in addition to Dr. Dudley will attend the Copenhagen Congress, the names of Wm. R. Webster,

Albert Sauveur, Tinius Olsen, R. L. Humphrey, Walter Wood and W. K. Hatt being already mentioned in this connection.

An Interesting Fox Miller Job.

An instance of the usefulness of its vertical milling attachment was had recently by the Fox Machine Company in its shops at Grand Rapids, Mich., when there was occasion to make a jig with eight holes spaced accurately equal distances apart. The illustration shows how the job was done on the No. 3½ Fox miller with universal dividing head and vertical attachment. The plate to be bored was mounted on a mandrel supported by the universal head and the tailstock on the top of the milling machine. The vertical attachment, which is capable of



Boring a Jig on a No. 3½ Fox Miller with Vertical Milling Attachment Swung Horizontally.

being swung to a vertical, horizontal or any intermediate position, was adjusted to a horizontal position and in it was mounted a short boring bar. This arrangement enabled the regular table feed to be used and the plates to be indexed for the different holes and the work was quickly and accurately executed, and the spacing was found to average not over 0.0005 in. out of the way. While this vertical milling attachment is especially adapted to the No. 3½ Fox miller, it may be made to fit other makes of millers.

With the beginning of the present fiscal year the republic of Cuba established a Bureau of Information, President Gomez appointing Leon J. Canova, an American newspaper man, who has resided in Cuba for a number of years and has a wide acquaintance with the island, as its director. Parties wishing information of any nature concerning Cuba can obtain it, free of charge, by writing to Mr. Canova, U. and I. Bureau (Utility and Information Bureau), Department of Agriculture, Commerce and Labor, Havana, Cuba.

The general manager of a large German foundry and machine shop is expected to arrive in this country in the second week in August for a three weeks' tour of American shops and mills. He is anxious to secure the services of an engineering student or a young mechanical or metallurgical engineer to act as interpreter.

The Baltimore & Ohio Railroad, the first railroad built in this country for the conveyance of passengers, was 81 years old July 4. Ground was broken for it in Baltimore July 4, 1828, by Charles Carroll of Carrollton, Md., the last surviving signer of the Declaration of Independence.

All the manufacturing establishments of Tipton, Ind., with one exception, use electricity as power, getting it from the municipal plant. The remaining factory is now preparing to change to electricity.

A Heavy Ohl Power Press.

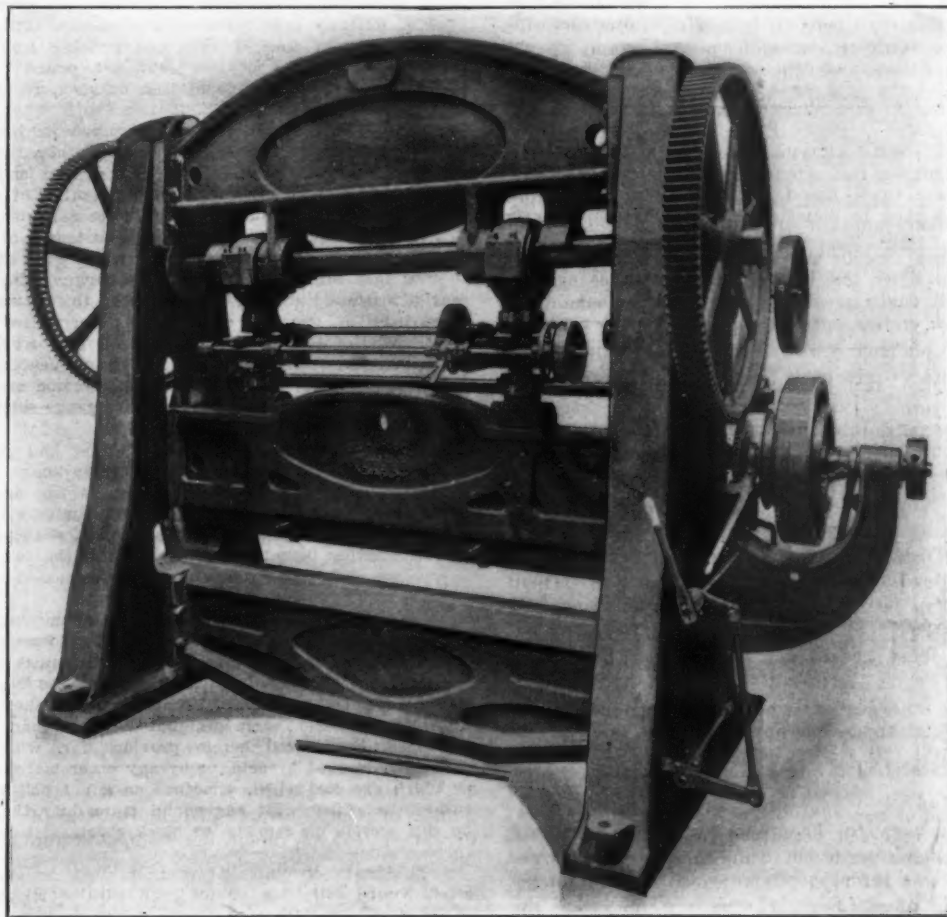
A very powerful combined power press and brake, capable of cold bending $\frac{1}{2}$ -in. soft steel to a right angle, was recently built for the Pressed Steel Car Company, Pittsburgh, Pa., by Geo. A. Ohl & Co., 157 Oraton street, Newark, N. J. It is designed for forming the relatively thick sheet metal work such as enters into the construction of steel passenger coaches and Pullman cars, metal lumber, steel cabinet work, metal furniture and bank fixtures.

The large openings in the housings, which are 30 in. wide and 15 in. high, permit long pieces to be passed through and bent up in successive strokes of the slide. Power is applied through a friction clutch to a short shaft at the left and rear of the machine as viewed in the illustration, and a gear on this shaft drives a long secondary shaft geared at each end to the large gears on the main or eccentric shaft. The latter is 8 in. in diameter and has four box bearings and two auxiliary half

position by a latch lever to transmit the drive through one or both of the intermediate gears and reverse the drive. When this lever is up the adjusting mechanism raises the slide and when down the slide is lowered. The hand wheel shown on the adjusting shaft is for very accurate adjustment.

The construction of the machine throughout is such that all strains are taken by machined shoulders and not on the holding bolts. Care has been taken in distributing the metal to provide the requisite strength without making the machine unnecessarily heavy. Large deflecting ribs have been added to the top casting to prevent side deflection, and heavy ribs across the top of the top casting and bottom of the bottom piece give a pronounced I-beam effect. The ribbing in the housing is continued in unbroken lines from top to bottom, thus giving the stiffest possible construction to these pieces.

The machine is controlled by hand or foot through the levers plainly shown and can be started and stopped instantly at any part of its stroke, as it is provided with



A Large Power Press Built by Geo. A. Ohl & Co., Newark, N. J.

bearings to take the upward thrust when working. All bearings in the housings are bushed with phosphor bronze.

Provision has been made so that all dies used in the machine are self-adjusting sideways, the upper die being held in place by a pair of vises. A change from one set of dies to another can be made in a few minutes. The slide has a stroke of 4 in. and a position adjustment of 4 in. to suit different heights of dies. The slide is rapidly adjusted through a power adjusting motion, which is operated by a supplementary clutch pulley, on the left of the flywheel, and controlled by the hand lever shown. A belt from this pulley drives a countershaft above and on the rear of the right housing, which is in turn belted to the adjusting shaft supported by bearings on the pitmans. A belt tightener automatically takes up slack in the second belt, so that the slide can be adjusted while it is in motion and the pitmans are oscillating back and forth. The adjusting shaft through intermediate tumbler gears drives the bevel pinion shaft, which through bevel gears simultaneously operates screws on the pitmans to raise or lower the slide. The three tumbler gears are mounted on a rocker arm and are thrown to either up or down

a combined clutch and brake mechanism which enables the operator to feel his way down to the blank about to be formed. This is claimed to be a valuable feature in that it enables difficult bends to be made with ease and at the same time protects the machine against accidental damage through careless setting of the dies or the introduction of sheets too thick for the dies being used.

The height of the machine is 16 ft. over all, it occupies a floor space 16 x 8 ft. and measures $12\frac{1}{2}$ ft. between the housings. The speed of the driving pulley is about 520 rev. per min. The machine weighs 108,000 lb. and requires about 35 hp. to drive it.

All publicity matters, including advertising, of the Westinghouse interests at Pittsburgh and East Pittsburgh, formerly handled by the Westinghouse Companies' Publishing Department, are now in care of the Westinghouse Bureau of Publicity. The new name was adopted in the belief that it would more clearly represent the functions of this department and also because of its brevity.

The Metal Schedule as Revised by the Senate.

The Complete Text of Schedule C of the New Tariff Bill, Showing the Changes the Senate Has Made in the Payne Bill as Passed by the House of Representatives.

The Text as Passed by the House is Printed in Roman Type; the Parts of the House Bill Stricken Out by the Senate Are Inclosed in Brackets; the New Matter Inserted by the Senate is Printed in Italics.

115½. Iron ore, including manganiferous iron ore, and manganiferous silver ore, and the dross or residuum from burnt pyrites, twenty-five cents per ton: *Provided, That in levying and collecting the duty on iron ore and manganiferous silver ore no deduction shall be made from the weight of the ore on account of moisture which may be chemically or physically combined therewith.*

116. [Iron in pigs, iron kentledge, and spiegeleisen, two dollars and fifty cents per ton; wrought and cast scrap iron, and scrap steel, fifty cents per ton] *Iron in pigs, iron kentledge, spiegeleisen, ferro-manganese, wrought and cast scrap iron, and scrap steel, two dollars and fifty cents per ton; but nothing shall be deemed scrap iron or scrap steel except waste or refuse iron or steel in such physical form as to be fit only to be remanufactured.*

117. Bar iron, muck bars, square iron, rolled or hammered, comprising flats not less than one inch wide nor less than three-eighths of one inch thick, round iron not less than seven-sixteenths of one inch in diameter, [four-tenths] *three-tenths* of one cent per pound.

118. Round iron, in coils or rods, less than seven-sixteenths of one inch in diameter, and bars or shapes of rolled or hammered iron, not specially provided for in [sections one or two of this Act] *this section*, six-tenths of one cent per pound: *Provided, That all iron in slabs, blooms, loops, or other forms less finished than iron in bars, and more advanced than pig iron, except castings, shall be subject to duty of four-tenths of one cent per pound: Provided further, That all iron bars, blooms, billets [or sizes or shapes of any kind], slabs or loops, in the manufacture of which charcoal is used as fuel, shall be subject to a duty of [ten] eight dollars per ton.*

119. Beams, girders, joists, angles, channels, car-truck channels, T T, columns and posts or parts or sections of columns and posts, deck and bulb beams, and building forms, together with all other structural shapes of iron or steel [whether plain or punched, or fitted for use, three-tenths of one cent per pound] *but not assembled, or manufactured, or advanced beyond hammering, rolling, or casting, valued at nine-tenths of one cent per pound or less, three-tenths of one cent per pound; valued above nine-tenths of one cent per pound, four-tenths of one cent per pound.*

120. Boiler or other plate iron or steel, except crucible plate steel and saw plates hereinafter provided for in [sections one or two of this Act] *this section*, not thinner than number ten wire gauge, cut or sheared to shape or otherwise, or unshaped, and skelp iron or steel sheared or rolled in grooves, valued at one cent per pound or less, three-tenths of one cent per pound; valued above one cent and not above two cents per pound, four-tenths of one cent per pound; valued above two cents and not above four cents per pound, seven-tenths of one cent per pound; valued at over four cents per pound, twenty per centum ad valorem: *Provided, That all sheets or plates of iron or steel thinner than number ten wire gauge shall pay duty as iron or steel sheets.*

121. Iron or steel anchors or parts thereof, one cent per pound; forgings of iron or steel, or of combined iron and steel, but not machined, toolled, or otherwise advanced in condition by any process or operation subsequent to the forging process, not specially provided for in [sections one or two of this Act] *this section*, thirty per centum ad valorem; [antifriction ball forgings of iron or steel, or of combined iron and steel] *antifriction balls, ball bearings, and roller bearings, of iron or steel or other metal, finished or unfinished, forty-five per centum ad valorem.*

122. Hoop, band, or scroll iron or steel, not otherwise provided for in [sections one or two of this Act] *this section*, valued at three cents per pound or less, eight inches or less in width, and less than three-eighths of one inch thick and not thinner than number ten wire gauge, three-tenths of one cent per pound; thinner than number ten wire gauge and not thinner than number twenty wire gauge, four-tenths of one cent per pound; thinner than number twenty wire gauge, six-tenths of one cent per pound: *Provided, That barrel hoops of iron or steel, and hoop or band iron or hoop or band steel flared, splayed or punched, with or without buckles or fastenings, shall pay one-tenth of one cent per pound more duty than that imposed on the hoop or band iron or steel from which they are made; [steel bands or strips, untempered, suitable for making band saws, hack saws, or butchers' saws, one and one-half cents per pound and twenty per centum ad valorem; if tem-*

pered, or tempered and polished, three cents per pound and twenty per centum ad valorem] bands and strips of steel exceeding twelve feet in length, not specially provided for in this section, thirty-five per centum ad valorem.

123. Hoop or band iron, or hoop or band steel, cut to lengths, or wholly or partly manufactured into hoops or ties, coated or not coated with paint or any other preparation, with or without buckles or fastenings, for baling cotton or any other commodity, three-tenths of one cent per pound.

124. Railway bars, made of iron or steel, and railway bars made in part of steel, T rails and punched iron or steel flat rails, seven-fortieths of one cent per pound; railway fish-plates or splice-bars, made of iron or steel, two-tenths of one cent per pound.

125. Sheets of iron or steel, common or black, of whatever dimensions, and skelp iron or steel, valued at three cents per pound or less, thinner than number ten and not thinner than number twenty wire gauge, five-tenths of one cent per pound; thinner than number twenty wire gauge and not thinner than number twenty-five wire gauge, six-tenths of one cent per pound; thinner than number twenty-five wire gauge and not thinner than number thirty-two wire gauge, eight-tenths of one cent per pound; thinner than number thirty-two wire gauge, nine-tenths of one cent per pound; corrugated or crimped, eight-tenths of one cent per pound; all the foregoing valued at more than three cents per pound; thirty per centum ad valorem: *Provided, That all sheets or plates of common or black iron or steel not thinner than number ten wire gauge shall pay duty as plate iron or plate steel.*

126. All iron or steel sheets or plates, and all hoop, band, or scroll iron or steel, excepting what are known commercially as tin plates,terne plates, and taggers tin, and hereinafter provided for, when galvanized or coated with zinc, spelter, or other metals, or any alloy of those metals, shall pay two-tenths of one cent per pound more duty than if the same was not so galvanized or coated; sheets or plates composed of iron, steel, copper, nickel, or other metal with layers of other metal or metals imposed thereon by forging, hammering, rolling, or welding [forty-five] *forty* per centum ad valorem.

127. Sheets of iron or steel, polished, planished, or glanced, by whatever name designated, one and [three-fourths] *one-half* cents per pound: *Provided, That plates or sheets of iron or steel, by whatever name designated, other than the polished, planished, or glanced herein provided for, which have been pickled or cleaned by acid, or by any other material or process, or which are cold-rolled, smoothed only, not polished, shall pay two-tenths of one cent per pound more duty than is imposed by this section on common or black sheets of iron or steel [of corresponding gauge or value].*

128. Sheets or plates of iron or steel, or taggers iron or steel, coated with tin or lead, or with a mixture of which these metals, or either of them, is a component part, by the dipping or any other process, and commercially known as tin plates,terne plates, and taggers tin, one and two-tenths cents per pound.

129. Steel ingots, cogged ingots, blooms, and slabs, by whatever process made; die blocks or blanks; billets and bars and tapered or beveled bars; mill shafting [material]; pressed, sheared, or stamped shapes, not advanced in value or condition by any process or operation subsequent to the process of stamping; [steel saw plates wholly or partially manufactured;] hammer molds or swaged steel; gun-barrel molds not in bars; alloys used as substitutes for steel in the manufacture of tools; all descriptions and shapes of dry sand, loam, or iron-molded steel castings; sheets, and plates and steel [in all forms and shapes] not specially provided for in [sections one or two of this Act] *this section*, all of the above valued at [eight-tenths] *three-fourths* of one cent per pound or less, seven-fortieths of one cent per pound; value above [eight-tenths] *three-fourths* of one cent and not above one and three-tenths cents per pound, three-tenths of one cent per pound; valued above one and three-tenths cents and not above one and eight-tenths cents per pound, five-tenths of one cent per pound; valued above one and eight-tenths cents and not above two and two-tenths cents per pound, six-tenths of one cent per pound; valued above two and two-tenths cents and not above three cents per pound, eight-tenths of one cent per pound; valued above three cents per pound and not above four cents per pound, one and one-tenth cents per pound; valued above four cents and not above seven cents per pound, one and two-tenths

cents per pound; valued above seven cents and not above ten cents per pound, [two] *one and nine-tenths* cents per pound; valued above ten cents and not above thirteen cents per pound, two and three-tenths cents per pound; valued above thirteen cents and not above sixteen cents per pound, two and seven-tenths cents per pound; valued above sixteen cents and not above [thirty cents per pound, four and six-tenths cents per pound; valued above thirty cents per pound, fifteen per centum ad valorem] *twenty-four cents per pound, four and six-tenths cents per pound; valued above twenty-four cents and not above thirty-two cents per pound, six cents per pound; valued above thirty-two cents and not above forty cents per pound, seven cents per pound; valued above forty cents per pound, twenty per centum ad valorem.*

130. Steel wool or steel shavings, [forty] *thirty-five* per centum ad valorem.

[131. Diamond steel, steel grit, diamond grit, iron form, iron sand, chilled iron sand, and similar articles by whatever name known, forty-five per centum ad valorem.]

131. *Grit, shot, and sand made of iron or steel, that can be used only as abrasives, one cent per pound.*

[132. The terms iron plates, steel plates, plate iron and plate steel, as used in this Act, shall be restricted to such articles having plane surfaces which may, however, be checkered, corrugated, or ribbed, for use as parts of constructions, but not as tools or implements in manufacturing.]

[WIRE:]

133. Wire rods: Rivet, screw, fence, and other iron or steel wire rods, whether round, oval, flat, or square, or in any other shape, and nail rods, *all the foregoing* in coils or otherwise, valued at four cents or less per pound, [four-tenths] *three-tenths* of one cent per pound; valued over four cents per pound, [three-fourths] *six-tenths* of one cent per pound: *Provided*, That all round iron or steel rods smaller than number six wire gauge shall be classed and dutiable as wire: *Provided further*, That all iron or steel wire rods which have been tempered or treated in any manner or partly manufactured shall pay an additional duty of one-half of one cent per pound.

134. Round iron or steel wire, not smaller than number thirteen wire gauge, one cent per pound; smaller than number thirteen and not smaller than number sixteen wire gauge, one and one-fourth cents per pound; smaller than number sixteen wire gauge, one and [one-half] *three-fourths* cents per pound: *Provided*, That all the foregoing [valued at more than four cents per pound] shall pay duty at [the rate of] *not less than* [forty] *thirty-five* per centum ad valorem; [all iron or steel wire] *all wire composed of iron, steel, or other metal except gold or silver*, covered with cotton, silk, or other material, corset clasps, corset steels, dress steels, and all flat wires, and [steel strips, strip steel, or] steel in strips, [twenty-five one-thousandths of one inch thick, or thinner,] *not thicker than number fifteen wire gauge and not exceeding five inches in width*, whether in long or short lengths, in coils or otherwise, and whether rolled or drawn through dies or rolls or otherwise produced, and all other wire not specially provided for in [sections one or two of this Act] *this section*, shall pay a duty of not less than [forty-five] *thirty-five* per centum ad valorem; on iron or steel wire coated by dipping, galvanizing or similar process with zinc, tin, or other metal, there shall be paid two-tenths of one cent per pound in addition to the rate imposed on the wire of which it is made: *Provided further*, That articles manufactured wholly or in chief value of any wire or wires provided for in this paragraph shall pay the maximum rate of duty imposed in this section upon any wire used in the manufacture of such articles and in addition thereto one [and one-fourth cents] cent per pound, [except that wire rope or wire strand shall pay the maximum rate of duty imposed in this section upon any wire used in the manufacture thereof and in addition thereto one cent per pound:] *And provided further*, That no article made from or composed of wire shall pay a less rate of duty than forty per centum ad valorem; *telegraph, telephone, and other wires and cables composed of metal and rubber, or of metal, rubber, and other materials, forty-five per centum ad valorem; barbed fence wire, three-fourths of one cent per pound, but the same shall not be subject to any additional or other rate of duty hereinbefore provided; wire heddles or heads, twenty-five cents per thousand, and in addition thereto forty per centum ad valorem.*

[GENERAL PROVISIONS:]

[135. No allowance or reduction of duties for partial loss or damage in consequence of rust or of discoloration shall be made upon any description of iron or steel, or upon any article wholly or partly manufactured of iron or steel, or upon any manufacture of iron or steel.]

[136. All metal produced from iron or its ores, which is cast and malleable, of whatever description or form, without regard to the percentage of carbon contained therein, whether produced by cementation, or converted, cast, or made from iron or its ores, by the crucible, Bessemer, Clapp-Griffith, pneumatic, Thomas Gilchrist, basic, Siemens-Martin, or open hearth process, or by the equivalent of either, or by a combination of two or more of the processes, or their equivalents, or by any fusion or other process which produces from iron or its ores

a metal either granular or fibrous in structure, which is cast and malleable, excepting what is known as malleable-iron castings, shall be classed and denominated as steel.]

[137. No article not specially provided for in this Act, which is wholly or partly manufactured from tin plate, terne plate, or the sheet, plate, hoop, band, or scroll iron or steel herein provided for, or of which such tin plate, terne plate, sheet, plate, hoop, band, or scroll iron or steel shall be the material of chief value, shall pay a lower rate of duty than that imposed on the tin plate, terne plate, or sheet, plate, hoop, band, or scroll iron or steel from which it is made, or of which it shall be the component thereof of chief value.]

[138. On all iron or steel bars or rods of whatever shape or section which are cold rolled, cold drawn, cold hammered, or polished in any way in addition to the ordinary process of hot rolling or hammering, there shall be paid one-eighth of one cent per pound in addition to the rates provided in sections one or two of this Act on bars or rods of whatever section or shape which are hot rolled; and on all strips, plates, or sheets of iron or steel, of whatever shape, other than the polished, planished or glanced sheet iron or sheet steel hereinbefore provided for, which are cold hammered, blued, brightened, tempered, polished, or treated in any way in addition to cold rolling to size, there shall be paid five-tenths of one cent per pound in addition to the rates provided in sections one or two of this Act upon strips, plates, or sheets of iron or steel of common or black finish of corresponding gauge or value; and on steel circular saw plates there shall be paid one-half of one cent per pound in addition to the rates provided in this section for steel saw plates.]

135. No article not specially provided for in this section, which is wholly or partly manufactured from tin plate, terne plate, or the sheet, plate, hoop, band, or scroll iron or steel herein provided for, or of which such tin plate, terne plate, sheet, plate, hoop, band, or scroll iron or steel shall be the material of chief value, shall pay a lower rate of duty than that imposed on the tin plate, terne plate, or sheet, plate, hoop, band, or scroll iron or steel from which it is made, or of which it shall be the component thereof of chief value.

136. On all iron or steel bars or rods of whatever shape or section which are cold rolled, cold drawn, cold hammered, or polished in any way in addition to the ordinary process of hot rolling or hammering, there shall be paid one-eighth of one cent per pound in addition to the rates provided in this section on bars or rods of whatever section or shape which are hot rolled; and on all strips, plates, or sheets of iron or steel of whatever shape, other than the polished, planished, or glanced sheet-iron or sheet-steel hereinbefore provided for, which are cold hammered, blued, brightened, tempered, or polished by any process to such perfected surface finish or polish better than the grade of cold rolled, smoothed only, hereinbefore provided for, there shall be paid four-tenths of one cent per pound in addition to the rates provided in this section upon plates, strips, or sheets of iron or steel of common or black finish; and on steel circular saw plates there shall be paid one-fourth of one cent per pound in addition to the rates provided in this section for steel plates.

137. No allowance or reduction of duties for partial loss or damage in consequence of rust or of discoloration shall be made upon any description of iron or steel, or upon any article wholly or partly manufactured of iron or steel, or upon any manufacture of iron or steel.

138. All metal produced from iron or its ores, which is cast and malleable, of whatever description or form, without regard to the percentage of carbon contained therein, whether produced by cementation, or converted, cast, or made from iron or its ores, by the crucible, Bessemer, Clapp-Griffith, pneumatic, Thomas-Gilchrist, basic, Siemens-Martin, or open-hearth process, or by the equivalent of either, or by a combination of two or more of the processes, or their equivalents, or by any fusion or other process which produces from iron or its ores a metal either granular or fibrous in structure, which is cast and malleable, excepting what is known as malleable-iron castings, shall be classed and denominated as steel.

[MANUFACTURES OF IRON AND STEEL:]

139. Anvils of iron or steel, or of iron and steel combined, by whatever process made, or in whatever stage of manufacture, one and [seven-eighths] *five-eighths* cents per pound.

[140. Automobiles and parts thereof, bicycles and parts thereof, and motorcycles and parts thereof, forty-five per centum ad valorem.]

140. Automobiles and finished parts thereof, not including tires, fifty per centum ad valorem; bicycles, and motorcycles, including the finished parts thereof, not including tires, forty-five per centum ad valorem.

141. Axles, or parts thereof, axle bars, axle blanks, or forgings for axles, whether of iron or steel, without reference to the stage or state of manufacture, *not otherwise provided for in this section*, valued at not more than six cents per pound, [one] *three-fourths* of a cent per pound: *Provided*, That when iron or steel axles are imported fitted in wheels, or parts of wheels, of iron or steel, they shall be dutiable at the same rate as the wheels in which they are fitted.

142. Blacksmith's hammers and sledges, track tools, wedges,

and crowbars, whether of iron or steel, one and [one-half] three-eighths cents per pound.

143. Bolts, with or without threads or nuts, or bolt blanks, and finished hinges or hinge blanks, whether of iron or steel, one and [one-fourth] one-eighth cents per pound.

[144. Card clothing not actually and permanently fitted to and attached to carding machines or to parts thereof at the time of importation, manufactured from tempered steel wire, forty-five cents per square foot; all other, twenty cents per square foot.]

144. Card clothing not actually and permanently fitted to and attached to carding machines or to parts thereof at the time of importation, when manufactured with round iron or steel wire, forty-five cents per square foot; when manufactured with plated wire or other than round iron or steel wire or with felt face, wool face, or rubber face cloth containing wool, fifty-five cents per square foot.

145. Cast-iron pipe of every description, one-fourth of one cent per pound.

146. Cast-iron andirons, plates, stove plates, sadirons, tailor's irons, hatter's irons, and castings and vessels wholly of cast iron, [eight-tenths of one cent per pound] valued at not more than two cents per pound, one-half of one cent per pound; valued at more than two cents per pound; thirty-five per centum ad valorem. All castings of iron or cast-iron plates which have been chiseled, drilled, machined, or otherwise advanced in condition by processes or operations subsequent to the casting process but not made up into articles, shall pay two-tenths of one cent per pound more than the rate imposed upon the castings of iron and cast-iron plates herein before provided for.

147. Castings of malleable iron not specially provided for in [sections one or two of this Act] this section, [nine-tenths] seven-tenths of one cent per pound.

148. Cast hollow ware, coated, glazed, or tinned, one and one-half cents per pound.

149. Chain or chains of all kinds, made of iron or steel, not less than three-fourths of one inch in diameter, seven-eighths of one cent per pound; less than three-fourths of one inch and not less than three-eighths of one inch in diameter, one and one-eighth cents per pound; less than three-eighths of one inch in diameter and not less than five-sixteenths of one inch in diameter, one and six-eighths cents per pound; less than five-sixteenths of one inch in diameter, three cents per pound; but no chain or chains of any description shall pay a lower rate of duty than forty-five per centum ad valorem.

150. Lap-welded, butt-welded, seamed, or jointed iron or steel [boiler] tubes, pipes, flues, or stays, not thinner than number sixteen wire gauge, if not less than three-eighths of an inch in diameter, one cent per pound; if less than three-eighths of an inch and not less than one-fourth of an inch in diameter, one and one-half cents per pound; if less than one-fourth of an inch in diameter, two cents per pound: *Provided, That no tubes, pipes, flues, or stays, made of charcoal iron, shall pay a less rate of duty than one and one-half cents per pound; cylindrical or tubular tanks or vessels, for holding gas [or] liquids, or other material, whether full or empty, thirty per centum ad valorem; flexible metal tubing or hose, not specially provided for in [sections one or two of this Act] this section, whether covered with wire or other material, or otherwise, including any appliances or attachments affixed thereto, thirty per centum ad valorem; welded cylindrical furnaces, tubes or flues made from plate metal, and corrugated, ribbed, or otherwise reinforced against collapsing pressure, two cents per pound; all other iron or steel tubes, finished, not specially provided for in [sections one or two of this Act] this section, thirty per centum ad valorem.*

[CUTLERY:]

151. Penknives, pocketknives, clasp knives, pruning knives, budding knives, erasers, manicure knives, [knives or razors for cutting corns,] and all knives by whatever name known, including such as are denominatively mentioned in this [Act] section, [which have folding or other than fixed blades or attachments,] valued at not more than forty cents per dozen, forty per centum ad valorem; valued at more than forty cents per dozen and not exceeding fifty cents per dozen, one cent per piece and forty per centum ad valorem; [all such cutlery, or parts thereof, wholly or partly manufactured,] valued at more than fifty cents per dozen and not exceeding one dollar and twenty-five cents per dozen, five cents per piece and forty per centum ad valorem; valued at more than one dollar and twenty-five cents per dozen and not exceeding three dollars per dozen, ten cents per piece and forty per centum ad valorem; valued at more than three dollars per dozen, twenty cents per piece and forty per centum ad valorem: *Provided, [That any of the foregoing knives or erasers, if imported in the condition of assembled, but not fully finished, shall be dutiable at not less than the rate of duty herein imposed upon fully finished knives and erasers of the same material and quality: And provided further, That blades, handles, or other parts of either or any of the foregoing articles imported in any other manner than assembled in finished knives or erasers, shall be subject to no less rate of duty than herein provided for the knives and erasers mentioned herein valued at more than fifty and not more than one dollar and twenty-five cents per dozen. Razors*

and razor blades, finished or unfinished, valued at less than one dollar and fifty cents per dozen, fifty cents per dozen and thirty per centum ad valorem; valued at one dollar and fifty cents per dozen and less than three dollars per dozen, one dollar per dozen and thirty per centum ad valorem; valued at three dollars per dozen or more, one dollar and seventy-five cents per dozen and thirty per centum ad valorem] *That any of the foregoing knives or erasers, if imported in the condition of assembled, but not finished, shall be dutiable at not less than the rate of duty herein imposed upon finished knives and erasers valued at more than three dollars per dozen: Provided, That blades, handles or other parts of any of the foregoing knives or erasers shall be dutiable at not less than the rate herein imposed upon knives and erasers valued at more than fifty cents per dozen and not exceeding one dollar and twenty-five cents per dozen; razors, finished, valued at less than one dollar per dozen, forty-five per centum ad valorem; valued at one dollar and less than one dollar and fifty cents per dozen, six cents each and forty per centum ad valorem; valued at one dollar and fifty cents and less than two dollars per dozen, ten cents each and forty per centum ad valorem; valued at two dollars or more per dozen, twelve cents each and fifty per centum ad valorem: Provided, That blades, handles, and unfinished razors shall pay no less duty than that imposed on finished razors valued at two dollars per dozen: Provided further, That on and after October first, nineteen hundred and nine, all the articles specified in this paragraph shall when imported have the name of the maker or purchaser and beneath the same the name of the country of origin die sunk conspicuously and indelibly on the shank or tang of at least one or, if practicable, each and every blade thereof. Scissors and shears, and blades for the same, finished or unfinished, valued at not more than fifty cents per dozen, fifteen cents per dozen and fifteen per centum ad valorem; valued at more than fifty cents and not more than one dollar and seventy-five cents per dozen, fifty cents per dozen and fifteen per centum ad valorem; valued at more than one dollar and seventy-five cents per dozen, seventy-five cents per dozen and twenty-five per centum ad valorem.*

[152. Sword blades, and swords and side arms irrespective of quality or use, in part of metal, fifty per centum ad valorem.]

152. Swords, sword blades, and bayonets, thirty-five per centum ad valorem.

153. Table, butchers', carving, cooks', hunting, kitchen, bread, butter, vegetable, fruit, cheese, carpenters' bench, curriers', drawing, farriers', fleshing, hay, tanners', plumbers', painters', palette, artists', and shoe knives, forks and steels, finished or unfinished; if imported with handles of mother-of-pearl, shell, ivory, silver, nicked silver, or other metal than iron or steel, fourteen cents each; with handles of deerhorn, ten cents each; with handles of hard rubber, solid bone, celluloid, or any pyroxyline material, four cents each; with handles of any other material than those above mentioned, one cent each, and in addition, on all the above articles, fifteen per centum ad valorem; any of the knives, forks or steels, enumerated in this paragraph, if imported without handles, forty per centum ad valorem: *Provided, [That no cutlery other than that provided for in sections one or two of this Act at ad valorem rates of duty shall pay a less rate of duty than forty per centum ad valorem] That none of the above-named articles shall pay a less rate of duty than forty per centum ad valorem: Provided, That all the articles specified in this paragraph when imported on and after October first, nineteen hundred and nine, shall have the name of the maker or purchaser and beneath the same the name of the country of origin indelibly stamped or branded thereon in a place that shall not be covered thereafter.*

[154. Files, file blanks, rasps, and floats, of all cuts and kinds, forty per centum ad valorem.]

154. Files, file blanks, rasps, and floats of all cuts and kinds, two and one-half inches in length and under, twenty-five cents per dozen; over two and one-half inches in length and not over four and one-half inches, fifty cents per dozen; over four and one-half inches in length and under seven inches, sixty-five cents per dozen; seven inches in length and over, eighty cents per dozen.

[FIREARMS:]

155. Muskets, muzzle-loading shotguns, rifles, and parts thereof, twenty-five per centum ad valorem.

156. Double-barreled, sporting, breech-loading shotguns, combination shotguns and rifles, valued at not more than five dollars, one dollar and fifty cents each and in addition thereto fifteen per centum ad valorem; valued at more than five dollars and not more than ten dollars, four dollars each and in addition thereto fifteen per centum ad valorem each; valued at more than ten dollars, six dollars each; double barrels for sporting breech-loading shotguns and rifles, further advanced in manufacture than rough bored only, three dollars each; stocks for double-barreled sporting breech-loading shotguns and rifles wholly or partially manufactured, three dollars each; and in addition thereto on all such guns and rifles, valued at more than ten dollars each, and on such stocks and barrels, thirty-five per centum ad valorem; on all other parts of such guns or rifles, and fittings for such stocks or barrels, finished or un-

finished, fifty per centum ad valorem: *Provided*, That all double-barreled sporting breech-loading shotguns and rifles imported without a lock or locks or other fittings shall be subject to a duty of six dollars each and thirty-five per centum ad valorem; single-barreled breech-loading shotguns, or parts thereof, except as otherwise specially provided for in [sections one or two of this Act] *this section*, one dollar each and thirty-five per centum ad valorem; pistols, automatic, magazine, or revolving, or parts thereof, seventy-five cents each and twenty-five per centum ad valorem.

[157. Sheets, plates, wares, or articles of iron, steel, or other metal, enameled or glazed with vitreous glasses, forty per centum ad valorem.]

157. Table, kitchen, and hospital utensils, or other similar hollow ware, of iron or steel, enameled or glazed with vitreous glasses, but not ornamented or decorated with lithographic or other printing, forty-five per centum ad valorem.

[NAILS, SPIKES, TACKS, AND NEEDLES:]

158. Cut nails and cut spikes of iron or steel, [five-tenths] four-tenths of one cent per pound.

159. Horseshoe nails, hob nails, and all other wrought iron or steel nails not specially provided for in [sections one or two of this Act] *this section*, one and one-half cents per pound.

160. Wire nails made of wrought iron or steel, not less than one inch in length and not lighter than number sixteen wire gauge, [one-fourth] one-half of one cent per pound; less than one inch in length and lighter than number sixteen wire gauge, [one-half] three-fourths of one cent per pound.

161. Spikes, nuts, and washers, and horse, mule, or ox shoes, of wrought iron or steel, [one-half] three-fourths of one cent per pound.

162. Cut tacks, brads, or sprigs, not exceeding sixteen ounces to the thousand, five-eighths of one cent per thousand; exceeding sixteen ounces to the thousand, three-fourths of one cent per pound.

163. [Needles for knitting, or sewing, machines, including latch needles, one dollar per thousand and twenty-five per centum ad valorem] *Needles for knitting or sewing machines, one dollar per thousand and twenty-five per centum ad valorem; latch needles, one dollar and twenty-five cents per thousand and thirty-five per centum ad valorem; crochet needles and tape needles, knitting and all other needles, not specially provided for in this section, and bodkins of metal, twenty-five per centum ad valorem; but no articles other than the needles which are specifically named in this [Act] section shall be dutiable as needles unless having an eye, and fitted and used for carrying a thread. Needle cases or needle books furnished with assortments of needles or combinations of needles and other articles, shall pay duty as entreties according to the component material of chief value therein.*

163½. Fish hooks, fishing rods and reels, artificial flies, artificial baits, snelled hooks and all other fishing tackle or parts thereof, not specially provided for in this section, except fishing lines, fishing nets and seines, forty-five per centum ad valorem.

164. Steel plates engraved, stereotype plates, electrotypes plates, and plates of other materials, engraved [or lithographed,] for printing, [twenty] twenty-five per centum ad valorem; plates of iron or steel engraved or fashioned for use in the production of designs, patterns, or impressions in glass in the process of manufacturing plate or other glass, twenty-five per centum ad valorem; lithographic plates of stone or other material, engraved, drawn, or prepared, and wet transfer paper or paper prepared wholly with glycerin, or glycerin combined with other materials, containing the imprints taken from lithographic plates, fifty per centum ad valorem.

165. Rivets, [or] studs, and steel points, lathed, machined, or brightened, and rivets or studs for nonskidding automobile tires, forty-five per centum ad valorem; rivets of iron or steel, not specially provided for in this section, one and one-fourth cents per pound.

[SAWS:]

166. Crosscut saws, five cents per linear foot; mill saws, eight cents per linear foot; pit and drag saws, six cents per linear foot; circular saws, twenty per centum ad valorem; steel band saws, finished or further advanced than tempered and polished, five cents per pound and twenty per centum ad valorem; hand, back, and all other saws, not specially provided for in this section, twenty-five per centum ad valorem.

167. Screws, commonly called wood screws, made of iron or steel, more than two inches in length, [two] three and one-half cents per pound; over one inch and not more than two inches in length, [four] five cents per pound; over one-half inch and not more than one inch in length, [six] eight cents per pound; one-half inch and less in length, [eight] twelve cents per pound.

168. Umbrella and parasol ribs and stretchers, composed in chief value of iron, steel, or other metal, in frames or otherwise, [thirty-five per centum ad valorem:] and tubes for umbrellas, wholly or partially finished, [thirty-five] fifty per centum ad valorem.

169. Wheels for railway purposes, or parts thereof, made of iron or steel, and steel-tired wheels for railway purposes, whether wholly or partly finished, and iron or steel locomotive, car, or other railway tires or parts thereof, wholly or partly manufactured, one and one-fourth cents per pound; ingots,

cogged ingots, blooms, or blanks for the same, without regard to the degree of manufacture, one cent per pound: *Provided*, That when wheels for railway purposes, or parts thereof, of iron or steel, are imported with iron or steel axles fitted in them, the wheels and axles together shall be dutiable at the same rate as is provided for the wheels when imported separately.

[MISCELLANEOUS METALS, AND MANUFACTURES OF:]

170. Aluminum, aluminum scrap, and alloys of any kind in which aluminum is the component material of chief value, in crude form, seven cents per pound; in plates, sheets, bars, and rods, eleven cents per pound; barium, calcium, magnesium, sodium, and potassium, and alloys of which said metals are the component material of chief value, three cents per pound and twenty-five per centum ad valorem.

171. Antimony, as regulus or metal, [three-fourths of one cent per pound] one and one-half cents per pound; antimony ore, stibnite and matte containing antimony, one cent per pound on the antimony contents therein contained: *Provided*, That on all importations of antimony-bearing ores and matte containing antimony the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishment they shall be sampled according to commercial methods under the supervision of government officers, who shall be stationed at such establishment, and who shall submit the samples thus obtained to a government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample, and report the result to the proper customs officers, and the import entry shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law, and the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph; antimony, oxide of, one and one-half cents per pound and twenty-five per centum ad valorem.

172. Argentine, albata, or German silver, unmanufactured, twenty-five per centum ad valorem.

173. Bronze powder, brocades, flitters, and metallics, [twelve] ten cents per pound; bronze, or Dutch-metal or aluminum, in leaf, six cents per one hundred leaves.

174. Copper, in rolled plates, called braziers' copper, sheets, rods, pipes, and copper bottoms, two and one-half cents per pound; sheathing or yellow metal of which copper is the component material of chief value, and not composed wholly or in part of iron ungalvanized, two cents per pound.

[GOLD AND SILVER:]

175. Gold leaf, thirty-five cents per one hundred leaves. The foregoing rate applies to leaf not exceeding in size the equivalent of three and three-eighths by three and three-eighths inches; additional duties in the same proportion shall be assessed on leaf exceeding in size said equivalent.

176. Silver leaf, ten cents per one hundred leaves.

177. Tinsel wire, lame or lahn, made wholly or in chief value of gold, silver, or other metal, [ten] five cents per pound; bullions and metal threads, made wholly or in chief value of tinsel wire, lame or lahn, [ten] five cents per pound and thirty per centum ad valorem; fabrics, laces, embroideries, braids, galloons, trimmings, ribbons, beltings, ornaments, toys, or other articles, made wholly or in chief value of tinsel wire, lame or lahn, bullions, or metal threads, fifteen cents per pound and sixty per centum ad valorem.

178. Hooks and eyes, metallic, whether loose, carded, or otherwise, including weight of cards, cartons, and immediate wrappings and labels, [four] five cents per pound and fifteen per centum ad valorem.

179. [Lead dross, including all dross containing lead, lead bullion or base bullion, lead in pigs or bars, old refuse lead run into blocks or bars, and old scrap lead fit only to be remanufactured, lead in any form not specially provided for in sections one or two of this Act, and the lead contents contained in lead bearing ores of all kinds; all the foregoing, one and one-half cents per pound.] *Lead-bearing ore of all kinds, one and one-half cents per pound on the lead contained therein: Provided*, That on all importations of lead-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

[180. Lead in sheets, pipe, shot, glaziers' lead, and lead wire, one and seven-eighths cents per pound.]

180. *Lead dross, lead bullion or base bullion, lead in pigs and bars, lead in any form not specially provided for in this section, old refuse lead run into blocks and bars, and old scrap lead fit only to be remanufactured; all the foregoing, two and one-eighth cents per pound; lead in sheets, pipe, shot, glaziers' lead and lead wire, two and one-half cents per pound.*

181. Metallic mineral substances in a crude state, and metals unwrought, whether capable of being wrought or not, not specially provided for in [sections one or two of this Act] this section, twenty per centum ad valorem; monazite sand and thorite [four] six cents per pound; *thorium, oxide of and salts of, and gas mantles treated with chemicals or metallic oxides, sixty per centum ad valorem; gas mantle scrap, consisting in chief value of metallic oxides, twenty per centum ad valorem.*

[182. Chrome or chromium metal, ferrochrome or ferrocromium, ferromolybdenum, ferrophosphorus, ferrotitanium, ferrotungsten, ferrosilicon containing more than fifteen per centum of silica, ferrovanadium, manganese metal, molybdenum, titanium, tantalum, tungsten or wolfram metal, fifteen per centum ad valorem; ferrosilicon containing not more than fifteen per centum of silica, and ferromanganese, four dollars per ton.]

182. *Chrome or chromium metal, ferrochrome or ferrocromium, ferromolybdenum, ferrophosphorus, ferrotitanium, ferrotungsten, ferrosilicon containing more than fifteen per centum of silica, ferrovanadium, molybdenum, titanium, tantalum, tungsten, or wolfram metal, valued at two hundred dollars per ton or less, twenty-five per centum ad valorem; valued at more than two hundred dollars per ton, twenty per centum ad valorem; ferrosilicon, valued at not exceeding ninety dollars per ton or containing not more than fifteen per centum of silica, six dollars per ton.*

183. Nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars, rods, plates, sheets, and strips cut from sheets, but not rolled or drawn, six cents per pound.

184. Pens, metallic, except gold pens, twelve cents per gross; with nib and barrel in one piece, fifteen cents per gross.

[185. Penholder tips, penholders or parts thereof, and gold pens, twenty-five per centum ad valorem; fountain pens, stylographic pens, and ink pencils, or parts of any of them, thirty per centum ad valorem: *Provided, That pens and penholders shall continue to be classified separately for duty purposes, but so-called combination penholders, comprising, besides a penholder, a pencil, rubber eraser, automatic stamp, or similar attachments, shall be assessed for duty as entireties according to the component material of chief value therein.*]

185. *Penholder tips, penholders and parts thereof, twenty-five cents per gross and twenty-five per centum ad valorem; gold pens, twenty-five per centum ad valorem; fountain pens, stylographic pens, thirty per centum ad valorem; combination penholders, comprising penholder, pencil, rubber eraser, automatic stamp, or other attachment, forty-five per centum ad valorem: Provided, That pens and penholders shall be assessed for duty separately.*

186. Pins with solid heads, without ornamentation, including hair, safety, hat, bonnet, and shawl pins; any of the foregoing composed wholly of brass, copper, iron, steel, or other base metal, not plated with gold or silver, and not commonly known as jewelry, thirty-five per centum ad valorem; [and agraffes, barettes, bars, belts, buckles, cabochons, chatelaines, clasps, combs, coulants, girdles, slides, dress, hat, and millinery ornaments, composed wholly of brass, copper, iron, steel, or other base metal, not plated nor polished nor commonly known as jewelry, forty per centum ad valorem; if plated, and not jewelry, forty per centum ad valorem; if any of the foregoing have fancy metal or enameled metal heads or plain heads of glass, paste, wax, or any other material than precious or semiprecious stones, forty-five per centum ad valorem; if the heads be in imitation of baroque pearls or be ornamented, decorated, cut or ground, forty-five per centum ad valorem; if imitation precious stones or imitation pearls or corals are set in the heads of the pins or the articles are otherwise mounted or set with imitation precious stones or imitation pearls or corals, fifty per centum ad valorem; any of the foregoing articles, if made wholly or in part of precious metal or if set with precious or semiprecious stones, or pearls, or corals, shall be classified as jewelry.]

187. Quicksilver, seven cents per pound. The flasks, bottles, or other vessels in which quicksilver is imported shall be subject to the same rate of duty as they would be subjected to if imported empty.

187½. *Tungsten-bearing ores of all kinds, fifteen per centum ad valorem.*

188. Type metal, one and one-half cents per pound on the lead contained therein; new types, twenty-five per centum ad valorem.

[189. Watch movements, whether imported in cases or not, if having not more than seven jewels, seventy cents each; if having more than seven jewels and not more than eleven jewels, one dollar and thirty-five cents each; if having more than eleven jewels and not more than fifteen jewels, one dollar and eighty-five cents each; if having more than fifteen jewels and not more

than seventeen jewels, one dollar and twenty-five cents each and twenty-five per centum ad valorem; if having more than seventeen jewels, three dollars each and twenty-five per centum ad valorem; watch cases and parts of watches, including watch dials, chronometers, box or ship, and parts thereof, clocks and parts thereof, not otherwise provided for in this section, whether separately packed or otherwise, not composed wholly or in part of china, porcelain, parian, bisque or earthenware, forty per centum ad valorem; all jewels for use in the manufacture of watches or clocks, ten per centum ad valorem: *Provided, That all watch movements and cases of foreign manufacture shall have the name of the manufacturer and of the city, town, or village, and country of manufacture cut, engraved, or die-sunk conspicuously and indelibly on the plate of the movement and the inside of the case, respectively, and the movements shall also have marked thereon by one of the methods indicated the number of jewels and adjustments, said number to be expressed both in words and in Arabic numerals; and none of the aforesaid articles shall be delivered to the importer unless marked in exact conformity to this direction.*]

189. *Watch movements, including time detectors, whether imported in cases or not, if having not more than seven jewels, sixty-five cents each; if having more than seven jewels and not more than eleven jewels, one dollar and thirty-five cents each; if having more than eleven jewels and not more than fifteen jewels, one dollar and eighty-five cents each; if having more than fifteen and not more than seventeen jewels, one dollar and twenty-five cents each and twenty-five per centum ad valorem; if having not more than seventeen jewels, three dollars each and twenty-five per centum ad valorem; watch cases and parts of watches, chronometers, box or ship, and parts thereof, forty per centum ad valorem; lever clock movements having jewels in the escapement, and clocks containing such movements, one dollar each and forty per centum ad valorem; all other clocks and parts thereof, not otherwise provided for in this section, whether separately packed or otherwise, not composed wholly or in part of china, porcelain, parian, bisque, or earthenware, forty per centum ad valorem; all jewels for use in the manufacture of watches or clocks, ten per centum ad valorem; enameled dials for watches or other instruments, three cents per dial and forty per centum ad valorem: *Provided, That all watch and clock dials shall have indelibly painted or printed thereon the country of origin, and, if attached to movements, in addition to the country of origin shall have the name of the maker, or makers, of such watch or clock movements indelibly painted or printed thereon, and that all watch movements, lever clock movements with jewels in the escapement, and cases of foreign manufacture shall have the name of the manufacturer and country of manufacture cut, engraved, or die-sunk conspicuously and indelibly on the plate of the movement and the inside of the case, respectively, and the movements shall also have marked thereon by one of the methods indicated the number of jewels and adjustments, said number to be expressed both in words and in Arabic numerals; and none of the aforesaid articles shall be delivered to the importer unless marked in exact conformity to this direction.**

[190. Zinc ore and calamine, one cent per pound on the zinc content contained therein: *Provided, That on all importations of zinc-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample, and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.*]

190. *Zinc-bearing ore of all kinds, including calamine, containing less than ten per centum of zinc, shall be admitted free of duty; containing ten per centum or more of zinc and less than twenty per centum, one-quarter of one cent per pound on the zinc contained therein; containing twenty per centum or more of zinc and less than twenty-five per centum, one-half of one cent per pound on the zinc contained therein; containing twenty-five per centum of zinc, or more, one cent per pound on the zinc contained therein: *Provided, That on all importations of zinc-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of government officers, who shall be stationed at such establishments, and who shall submit the samples thus**

obtained to a government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample, and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

[191. Zinc in blocks or pigs, one cent per pound; in sheets, one and one-fourth cents per pound; in sheets coated or plated with nickel or other metal, or solutions, one and one-half cents per pound; old and worn out, fit only to be remanufactured, one cent per pound.]

[191. Zinc in blocks or pigs and zinc dust, one and one-half cents per pound; in sheets, one and three-fourths cents per pound; in sheets coated or plated with nickel or other metal, or solutions, two cents per pound; old and worn-out, fit only to be remanufactured, one cent per pound.]

[192. Alloys and other mixed metals in lumps, pigs, blocks, bars, cakes, sheets, or powder, not specially provided for, twenty per centum ad valorem.]

[192. Cans, boxes, packages, and other containers of all kinds (except such as are hermetically sealed by soldering or otherwise), composed wholly or in chief value of metal lacquered or printed by any process of lithography whatever, if filled or unfilled, and whether their contents be dutiable or free, four cents per pound and thirty-five per centum ad valorem: Provided, That none of the foregoing articles shall pay a less rate of duty than fifty-five per centum ad valorem; but no cans, boxes, packages, or containers of any kind, of the capacity of five pounds or under, subject to duty under this paragraph, shall pay less duty than if the same were imported empty; and the dutiable value of the same shall include all packing charges, cartons, wrappings, envelopes, and printed matter accompanying them when such cans, boxes, packages, or containers are imported wholly or partly filled with merchandise exempt from duty (except liquids and merchandise commercially known as drugs) and which is commonly dealt in at wholesale in the country of original exportation in bulk or in packages exceeding five pounds in capacity: Provided further, That paper, cardboard, or pasteboard wrappings or containers that are made and used only for the purpose of holding or containing the article with which they are filled, and after such use are mere waste material, shall not be dutiable unless their contents are dutiable.]

[193. Bottle caps, if not colored or embossed in color, forty-five per centum ad valorem; if lacquered, enameled, lithographed, or embossed in color, fifty-five per centum ad valorem.]

[193. Bottle caps, if not colored, waxed, lacquered, enameled, lithographed, or embossed in color, one-half of one cent per pound and forty-five per centum ad valorem; if colored, waxed, lacquered, enameled, lithographed, or embossed in color, fifty-five per centum ad valorem.]

[194. Cash registers, [electrical machinery, jute manufacturing machinery], linotype and all typesetting machines, machine tools, printing presses, sewing machines, typewriters, and all steam engines, thirty per centum ad valorem; embroidery machines and lace-making machines, including machines for making lace curtains, [nets, or nettings,] forty-five per centum ad valorem: [Provided, however, That all embroidery machines and lace making machines, including machines for making lace curtains, nets, or nettings, imported prior to July first, nineteen hundred and eleven, shall be admitted free of duty] Provided, however, That all machines used for the manufacture of linen or cloth from flax and flax fiber, imported prior to January first, nineteen hundred and twelve, shall be admitted free of duty.]

[194½. Nippers and pliers of all kinds, except blacksmiths' tongs, surgical and dental instruments or parts thereof, wholly or partly manufactured, ten cents per pound and forty per centum ad valorem.]

[195. Articles or wares not specially provided for in [sections one or two of this Act] this section, composed wholly or in part of iron, steel, lead, copper, nickel, pewter, zinc, gold, silver, platinum, aluminum, or other metal, and whether partly or wholly manufactured, forty-five per centum ad valorem.]

The National Association of Cement Users, Richard L. Humphrey, president, Harrison Building, Philadelphia, announces that its sixth annual convention will be held in Chicago, February 17 to 24, 1910. An exhibition will be held jointly with and under the auspices of the Cement Products Exhibition Company.

The United States Treasury Department reports the deficit in the national revenue at \$89,811,156 for the fiscal year ending June 30, 1909. The estimate of the deficit made last December was \$114,000,000. Results were, therefore, much better than had been anticipated. The last month of the fiscal year was the only one showing a surplus.

Rolling Mill Motors.*

BY E. W. YEARSLEY.

Protection is extremely important in the steel mill where conditions are necessarily uncleanly and electrical apparatus must work in the midst of dust, moisture and gases. Large motors should be inclosed in solidly built tight compartments, ventilated by clean air if necessary, or should be of the totally inclosed type. Considered economically, the writer believes main motor drives to be superior to engine drives, even when power must be derived from a steam engine driven generator plant fed by coal fired boilers. Steam losses due to condensation and leaky valves and rings are surprisingly large, but usually escape definite measurement. Then in the usual rolling mill engine, very little expansion is utilized, and it is not likely that attempts to refine such machines are satisfactory. Where water power or waste gas is available there is no question of the greater economy of electric drive.

The controlling apparatus for mill service is usually the weak part of the system; it is much less satisfactory than the motors. Mechanical strength and simplicity are the main points to be observed in designing this apparatus. Heavier and more mechanical switches and circuit breakers, better protected and more durable rheostats and more dependable automatic controlling devices requiring less attention are badly needed. This is a problem more difficult of solution than improvement of the motor, but no less necessary.

For large main drive motors the advantage of continuous running at constant speed is so great that it would appear advisable to make the design of the mill suit the characteristics of the motor, and avoid the extra expense and complication of devices like the reversing drive. The tendency has been to build a machine and then to couple on a motor somewhere to drive it. This mistake, while not so frequent as formerly, is still made.

There seems to be no great difficulty in designing mills for continuous running motors. By combining such motors with a suitable flywheel it should be possible to keep the line load sufficiently uniform. This combination has not, in the writer's opinion, received sufficient attention, possibly because of lack of knowledge of power and speed regulations of the rolling operation.

Tests of these characteristics will be comparatively easy on electric mills, so that data will rapidly become available for supplying the system with the proper inertia. In some installations the writer has seen the flywheel so badly proportioned as to be detrimental to the operation of the motor. Initial speeds should be carefully selected, especially when the drive is direct, and if possible a considerable speed regulation should be provided, so that the speed may be increased with increase in proficiency of the operators.

The importance of low armature inertia for reversing motors is now well recognized, but designs could be improved by still further reduction in speed. The writer is decidedly against the use of high speed motors for any kind of mill service and believes the extra cost of slow speed machines well warranted.

Electric motors subject to excessive vibration communicated from the gearing and other parts of the machine should be protected by a flexible coupling.

For mill apparatus which must be handled directly, especially for direct current apparatus, the writer favors a maximum of 250 volts. Safety of employees requires that with higher voltages special guards be provided to isolate the apparatus.

Alternating current and direct current motors and apparatus both have their advantages for steel mill installations. Local conditions must determine which is superior. Unless transmissions are too long the writer favors a direct current installation, especially if the plant has many machine tools. With an alternating current system as few direct current motors as possible should be used.

* A paper read at the 26th annual convention of the American Institute of Electrical Engineers, Frontenac, N. Y., June 30, 1909.

A Barnes Heavy Duty 22 1/2-In. Gang Drill.

A new gang drill recently brought out by the W. F. & John Barnes Company, Rockford, Ill., is shown in Fig. 1. This is a heavy duty 22 1/2-in. swing gang drill, equipped with back gearing, power feed and automatic stop and positive feeds. The machine as regularly equipped has the driving capacity of a 34-in. drill and can be furnished when desired with a special three-step cone pulley that will carry a 4 1/4-in. belt, with which it is capable of driving a 2 1/2-in. drill in solid steel.

Particular attention is called to the positive feed and

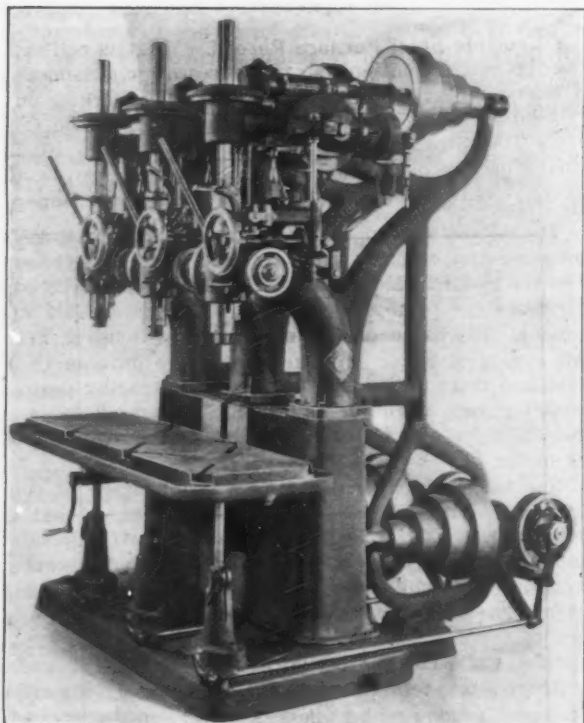


Fig. 1.—A Heavy Duty 22 1/2-In. Gang Drill with Back Gears, Power Feed and Automatic Stops, Built by the W. F. & John Barnes Company, Rockford, Ill.

the spindle free to be moved up and down by the lever *e*, but the spindle can be raised and lowered in the usual way through the hand wheel *d*, which gives a slower but of course a more accurate adjustment. Where a quick return is wanted at the end of a drilling operation it is an advantage to use the automatic stop which throws the worm out of engagement with the worm wheel—that is, the same movement that is effected by the lever *a*.

Fig. 3 gives the rear view of the countershaft of a four-spindle drill, similar to the drill shown in Fig. 1, except that the latter has only three spindles. The countershaft is driven by one belt and a foot controlled clutch is provided for each drill independently; thus all spindles can be run at one time or separately. The countershaft being driven by one belt saves considerable in the amount of belting that would be required if each spindle had an individual countershaft. For ordinary work the tight and loose pulleys run at about 225 rev. per min. The adjustment of the main shaft bearings is another feature. By this method of mounting the bearings, adjustment is per-

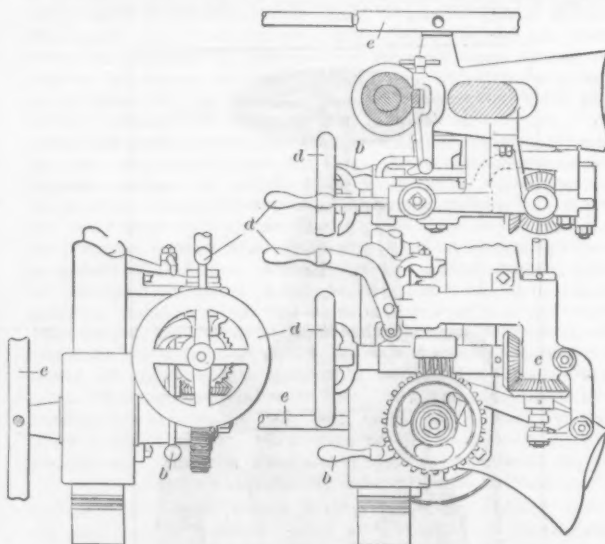


Fig. 2.—Top View and Side and End Elevations of the Feeding Mechanism.

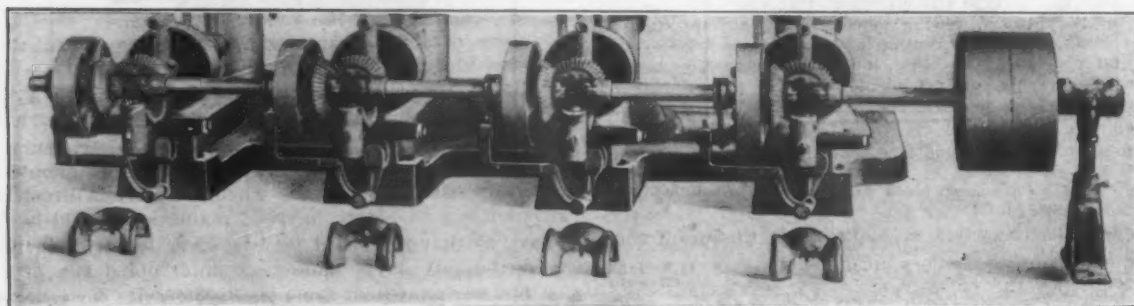


Fig. 3.—Rear View of the Countershaft of a Four-Spindle Drill.

especially to the lower feeds. In Fig. 2 is shown a top view and side and end elevations of the section of the drill carrying the feeding mechanism. Details are shown in this view of the novel lower feed. The operator has the choice of two automatic stops, one for throwing the worm out of mesh with the worm gear on the cross spindle and the other for stopping the main feed by throwing out miter gears at the rear. These automatic stops are also operated by hand. Through the lever *a*, Fig. 2, the worm on the shaft with the hand wheel *d* can be lifted out of engagement with the worm wheel, which leaves the spindle free to be raised or lowered by the hand or lever feed *e* on the left side of the spindle. This is of advantage when doing such work as the facing at the end of a drilling or boring job. The second throwout is the one commonly employed for disengaging an automatic feed and is operated by hand through the lever *b*, which lowers the miter gear *c* from engagement with the gear on the shaft with the hand wheel *d*. This does not leave

mitted of any bearing without taking the countershaft apart. Where it is preferred, however, the countershaft can be furnished with tight and loose pulleys for each spindle.

Following are some of the more important dimensions of the machine:

Height of drill.....	86 in.
Distance from center to center of spindles.....	20 in.
Diameter of spindle.....	1 15-16 in.
Hole in spindle.....	No. 4 Morse taper.
Vertical travel of spindle.....	14 1/2 in.
Vertical travel of table.....	14 1/2 in.
Maximum distance from spindle to table.....	28 1/4 in.
Minimum distance from spindle to table.....	13 1/4 in.
Diameter of crown gear.....	9 1/4 in.
Diameter of bevel pinion.....	4 1/2 in.
Ratio of back gears.....	6 1/4 to 1.

These gang drills are built with two, three or four spindles. The floor space required by a three-spindle drill, such as is shown in Fig. 1, is 66 x 84 in., and the weight is 6000 lb.

The Golden Cushioned Triple-Acting Nonreturn Valve.

In steam power plants there is need of a valve to operate instantly and automatically at the bursting of a pipe, fitting or valve, or any other accident. Such a valve is the Golden cushioned triple-acting nonreturn valve made by the Golden-Anderson Valve Specialty Company, Pittsburgh, Pa. It even eliminates dependence on the presence of mind of employees to remember the location of three-way cocks or valves to turn on steam to operate the emergency valves in case of accident. This valve is an automatic nonreturn valve, an automatic safety stop valve, an automatic emergency stop valve, and a hand stop valve all in one. The nonreturn feature automatically protects the boilers in case of accident, such as the bursting of a tube, and will act as a safety stop to prevent steam from being turned into a cold boiler, which means a safeguard for men working inside of it. The automatic safety stop feature protects life and property in case a break or rupture occurs in the main steam line

instantly open, exhausting the pressure from between the two dash pots. The full boiler pressure always being above dash pot A, the valve will close; at the same time it is cushioned in the operation. The automatic pilot valve is simple in construction and positive in operation. The cushioned triple-acting nonreturn valves can be tested at any time and as often as desired without interfering in any way in the operation of the plant. The valves are claimed to be the heaviest made and by virtue of their inside mechanical construction are guaranteed not to chatter, hammer or stick, and to be satisfactory, durable and entirely automatic. They are made in sizes from 4 to 12 in.

A Crucible Steel Furnace Record.—What is believed to be the longest continuous run on record for a Siemens-Martin type of crucible steel melting furnace working entirely on tool steel has just been completed by the Columbia Tool Steel Company, Chicago Heights, Ill. No. 2 furnace in this plant was started October 7, 1907, and was run continuously night and day under the super-



Fig. 1.—Exterior View.

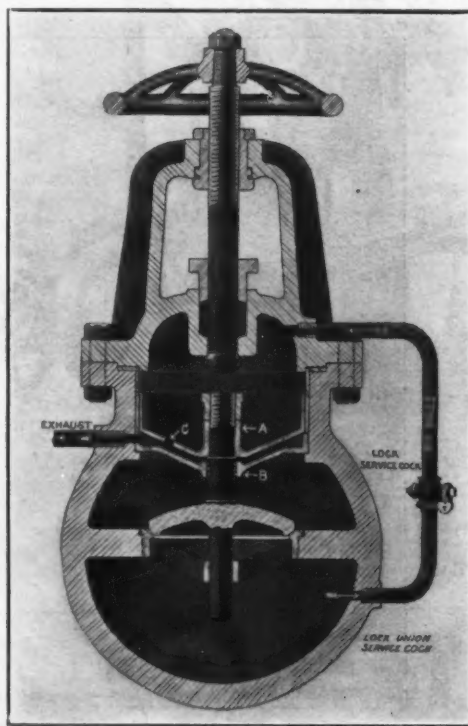


Fig. 2.—Sectional View.

The Golden Cushioned Triple-Acting Nonreturn Valve.

or branches, and the valves will automatically cut off the flow of steam from the boilers until the break is repaired. In an emergency the valve can also be used as a steam closing valve operated from the floor or different parts of the plant independently of the pilot valves, and it may also be closed by hand the same as an ordinary valve.

The Corliss dash pot method of cushioning these valves is employed. The dash pot occupies the full area of the upper portion of the body, insuring a positive cushion in the opening and closing of the valve, and perfect alignment with the seat at all times regardless of the position. Fig. 1 shows an exterior view of the valve and Fig. 2 a sectional view. In Fig. 2 the piston of the dash pot is shown at A attached to the spindle and the cylinder of the dash pot at B. The latter is bronze and is held firmly in place by a flange clamped between the body and bonnet of the valve. As shown in Fig. 2, a bypass admits full boiler pressure above and underneath the inside dash pot at C, therefore it is balanced. A connection from the main steam line to the automatic pilot valve (not shown) causes the latter to be kept closed because of the larger area above its valve. There is also a steam connection made between the two dash pots, marked "exhaust" in Fig. 2, which leads to the pilot valve. If a rupture occurs in the steam line, pressure is removed from the top of the pilot valve, allowing it to

vision of Wm. J. Mathews up to July 1 this year, which, lacking but six days, made an uninterrupted run of 21 months, during which time approximately 3000 heats, aggregating about 4500 tons, were taken off. When compared with the practice of but a few years ago, when furnaces of this type were scarcely expected to run more than five or six weeks and when a run of five or six months was considered by tool steel makers as something phenomenal, this experience is of especial interest as indicating an economic phase of developments in this department of steel production. While it must be conceded that the achievement of this record was in no small measure due to the care and skill exercised in the handling of the furnace by the melter in charge, the quality of its refractory lining was undoubtedly an important contributing factor in the result. It therefore serves to emphasize the excellent quality of refractory brick manufactured in this country and indicates something of the progress that has been made in this industry.

Thomas Firth & Co., steel makers, Sheffield, England, announce an issue of £150,000 mortgage debenture stock at par, bearing 4½ per cent. interest. The company has recently made large extensions at Sheffield, including the building of new works at Tinsley.

THE PANAMA CANAL—II.

Records of the Machinery Employed in Its Construction.

BY J. F. SPRINGER.

The Dredges.

While dry excavation preponderates and the canal could scarcely be built in an economical way without the assistance of such machines as the Bucyrus and Marlon steam shovels, at the same time the dredge is a great factor at Panama. The work going on between Gatun and the Miraflores locks has so far been almost entirely dry excavation, but from the Atlantic to Gatun and from the Pacific to Miraflores locks the dredges are the great excavators. Some of the old French dredges have been rehabilitated and are doing excellent service. There are in use at Panama the ladder, dipper, grab bucket and suction types. Two of the principal dredges are the Culebra (Fig. 5) and Ancon, both sea-going and of the

and rock are such every-day spoil that they attract no attention. The suction pipes, two in number, deliver the material excavated, together with an inevitable quantity of water, to bins located in the dredge itself. The water amounts to about 40 per cent. of the spoil delivered. In estimating the yardage contained in the bins two-fifths is accordingly deducted for water.

The French employed a number of dredges of the ladder type, about 16 of which were bought with other property when the Americans took control. These accomplish excavation by means of an endless chain of buckets or scoops. Such a scoop has a capacity of about $\frac{1}{2}$ cu. yd. It consists of a cast-steel back to which is riveted a steel front and bottom about $\frac{3}{4}$ in. thick. There

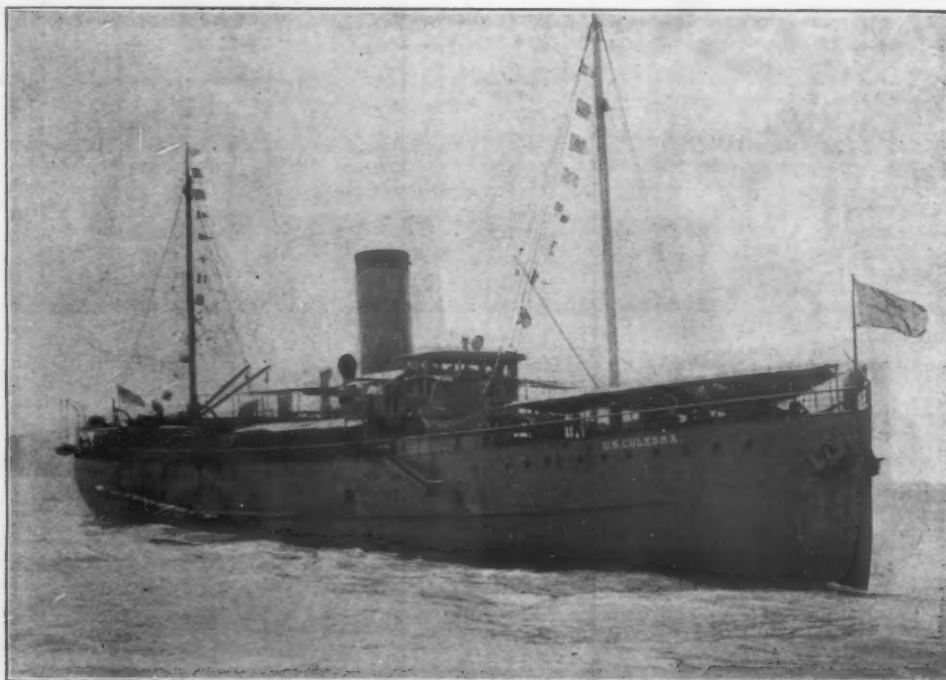


Fig. 5.—The Sea-Going Dredge Culebra.

suction type. These are large vessels, each being 288 ft. long over all, 47½ ft. beam and 25 ft. deep.

The Culebra is at work at the Pacific end. To reach her station she went under her own steam from Chesapeake Bay south to the Straits of Magellan and thence north to the Bay of Panama. The Ancon likewise went to her post under her own steam and from the same point. These dredges work 24 hr. per day, six days per week. Each is accomplishing the work of about eight excellent steam shovels. The shovels work only 8 hr. per day, consequently the real efficiency of such a dredge is really 2-3 times that of the shovel. On the Atlantic side there is little or no tide, while on the Pacific side the variation from high water to low is about 20 ft. In consequence the channel while being cut by the Ancon from about the 45-ft. line in Limon Bay at the north end of the canal was always out of sight, while that being dredged at the south end by the Culebra was at times partially visible. But the work went on whether in sight or not, each removing upward of 15,000 cu. yd. of spoil per day. These dredges accomplish their work by large centrifugal pumping machinery. The shoes at the ends of the great suction pipes have apertures 6 x 9 in. in size. Stones which will pass through these holes are readily handled. Heavy clay is somewhat difficult. Not long ago the Culebra picked up 60 ft. of chain from the bottom and took care of it without trouble. The Ancon sucked up a cannon ball. It is said that fish, eels, shells

is a cutting edge of steel 1 in. thick. On the dredge there is an upper and a lower tumbler wheel, and the operation of driving the chain of scoops is effected by operating the upper one. In action, there is a continuous scooping operation. It is a procedure rather unfamiliar to Americans not engaged in gold dredging. However, these dredges have been found quite effective when employed in work suited to them. The maximum depth to which they have been operated at Panama is about 30 ft. They are not suited for the removal of hard dense material, but where sand or mud and the like are to be excavated they are efficient. Including all operating expenses they have excavated material for 9 and 10 cents per cubic yard and even as low as 5 cents. This expense includes the operation of the barges which serve them. The hulls are of wrought iron and seem to have resisted corrosion remarkably, although exposed in some cases upward of 18 years. The Americans have rebuilt certain of these old dredges. In October, 1907, three of these rebuilt dredges excavated 133,064 cu. yd., 143,222 cu. yd. and 143,885 cu. yd., respectively, operating continuously, except Sundays. In March, 1908, the Gopher, a ladder dredge working on the Pacific end, excavated 168,375 cu. yd. This was slightly exceeded in October by ladder dredge No. 1, which removed 168,796 cu. yd.

The dipper dredge is really a steam-shovel mounted on a barge, but usually of heavier construction, and longer reach. Two sizes of dippers are used; one of 5-cu.

yd. capacity is employed in soft material, as sand or mud, while a 3-yd. bucket is used in rock excavation. These smaller dippers are equipped with strong teeth of manganese steel. These remarks apply especially to dredges built by the Atlantic, Gulf and Pacific Dredge Company, and the Featherstone Foundry & Machine Company. The dipper dredge Chagres has excavated rock from a depth of 30 ft. or more at the Atlantic end of the canal. From the lowest pair of the Gatun locks to the northern ter-

the Gatun dam there is to be constructed an immense earth-work, which will constitute the dam proper. The sand and clay for this mound of earth will be largely, if not entirely, put in place by means of pipe-line suction dredges (Fig. 6). These dredges excavate by suction in co-operation with a cutting tool and are suited for excavating heavy clay. The cutter, Fig. 7, is independently operated. The material cut up and sucked along is discharged through a pipe which is supported by pon-

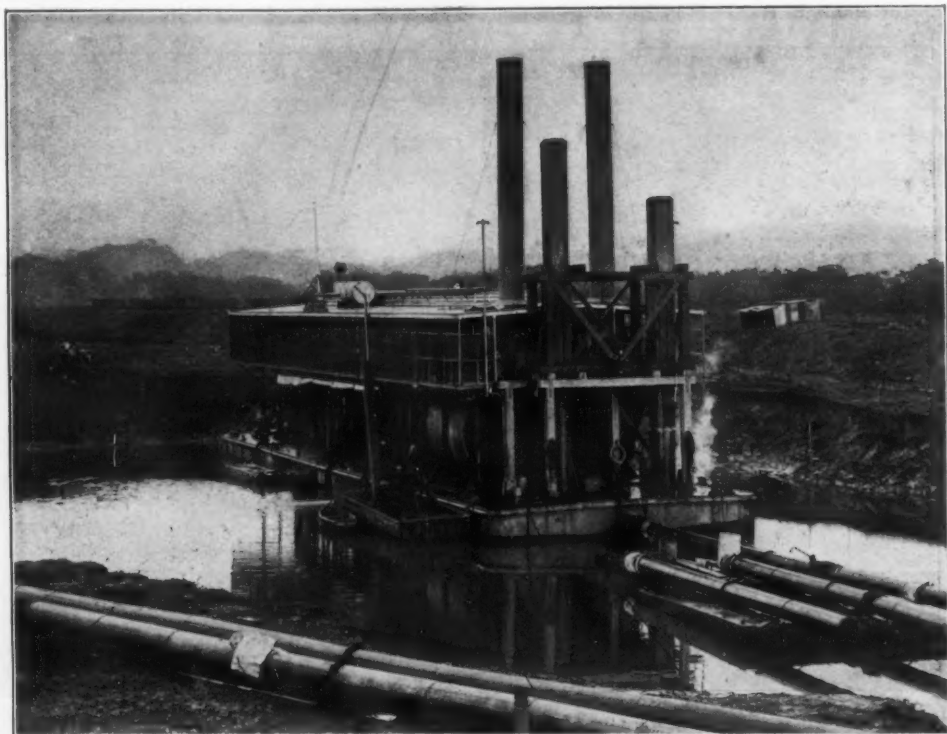


Fig. 6.—One of the Suction Dredges.

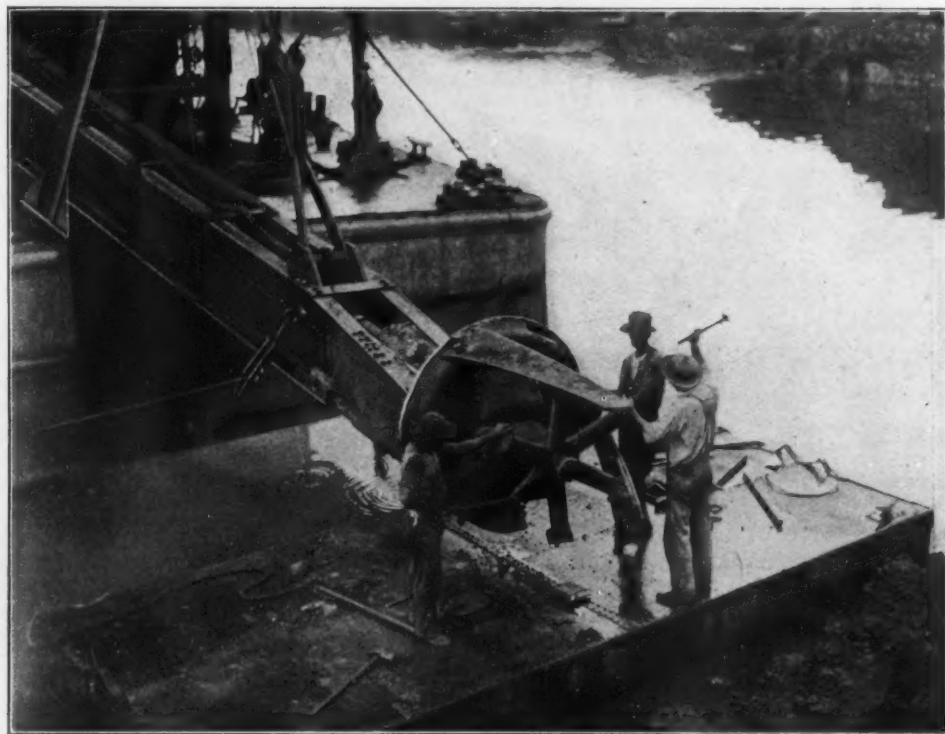


Fig. 7.—The Cutting Blades at the Intake of a Suction Dredge.

minus, the canal is to be 41 ft. below sea-level. The Chagres is able to excavate to this maximum depth. This dredge has been dredging blasted blue rock at about 80 cents per cu. yd.

We have given some account of the sea-going suction dredges Ancon and Culebra. But there are other dredges in use of the suction type which have a somewhat different function to perform. It will be remembered that in the 1200-ft. space between the north and south toes of

toons until the shore is reached, when it may be laid on the ground and prolonged to such distance and height as conditions make desirable and possible. A volume of water accompanies the material being transported and is, in fact, an essential factor in the transportation. In mountainous localities it is often possible to utilize a natural head of water in connection with the pipe-line suction dredge. At Panama, however, dependence will have to be upon an artificial flow of water. The summit

of the Gatun dam is to be 115 ft. above sea-level. The locations in the vicinity of the dam where these dredges will work will, none of them, be at considerable elevation, so that it is possible that a single pumping will be insufficient to deposit material at this maximum height.

Two of the dredges are of steel construction and 135 ft. long, 36 ft. wide and 9 ft. deep. Each has a 20-in. pump with double suction, operated by two tandem compound condensing engines, developing about 450 i.h.p. Such a pump is economically capable of elevating material to a height of about 75 ft. It is proposed to use one

day of two shifts. Another, No. 83, was delivering spoil at the rate of over 9000 cu. yd. per day at the end of the same month. The cost of operation of these two dredges was less than 15 cents per cubic yard of material put upon the dam. But these results covered too short a time to be regarded as reliable average costs, and refer to special conditions of level and of extent of horizontal transport. Dredge No. 83 has worked considerably since February at the fill between the two toes of the dam. In April this dredge excavated and deposited nearly 143,000 cu. yd. of material in place. Altogether, the total

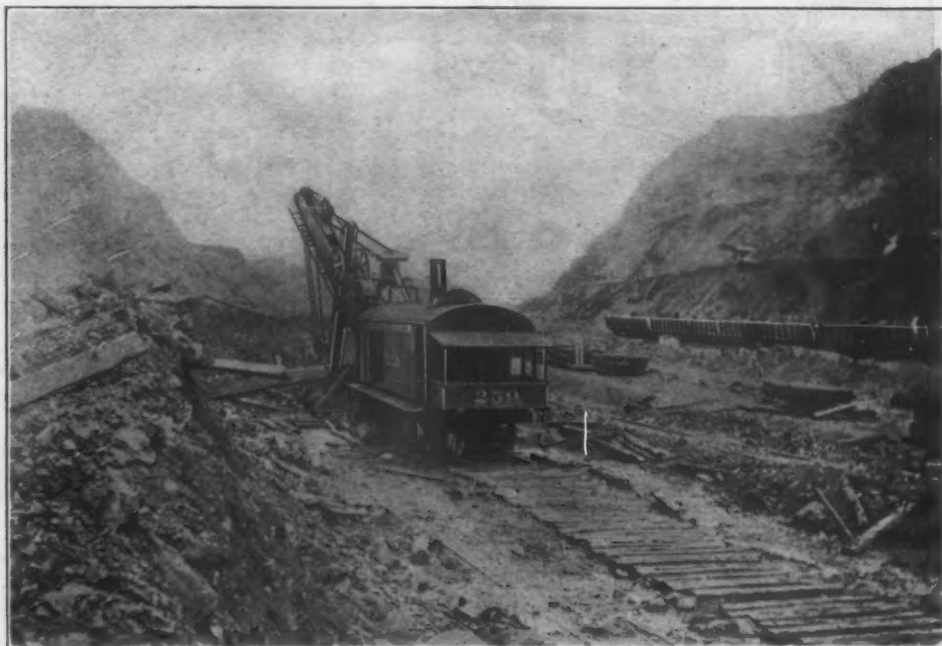


Fig. 8.—One of the 105-Ton Marion Steam Shovels.

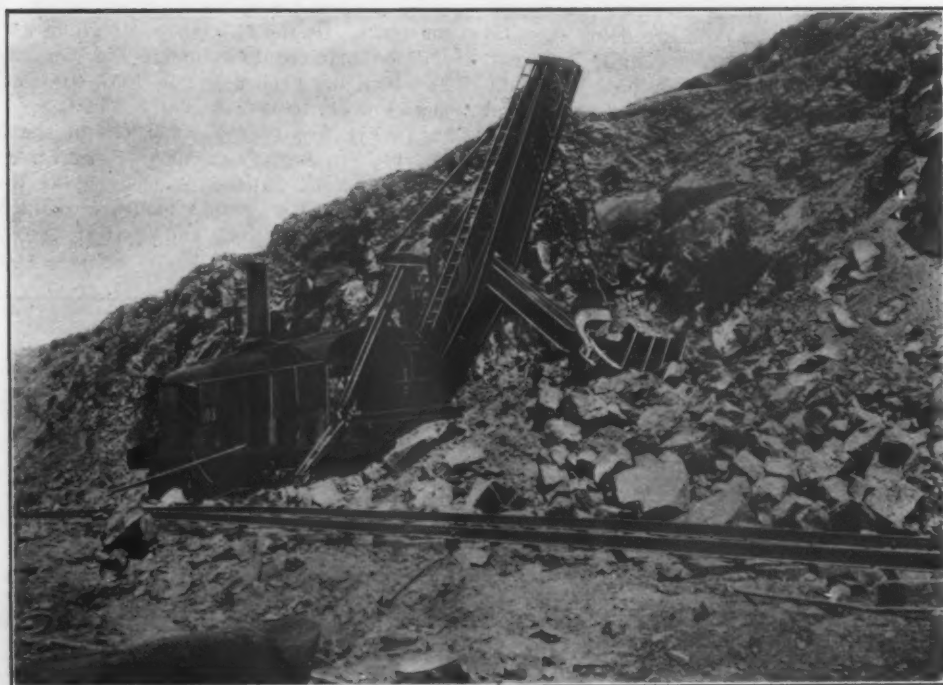


Fig. 9.—A Bucyrus 70-Ton Shovel in a Rock Cut.

or more pumps as relays to assist that of the dredge proper in securing the necessary horizontal and vertical transportation. According to F. B. Maltby, the idea has been to use motor driven relay pumps. The pipe line from the dredge or a previous relay will enter the suction side of the relay. By the employment of motors at these relays the necessity for special steam plants and foundations is avoided.

Work has already been begun on filling in the space between the toes. Thus the 20-in. suction dredge No. 82 was dumping material upon the site of the dam early in February at the rate of about 4000 cu. yd. per working

material put in position by dredges up to the end of April was about 400,000 cu. yd. As the total fill will amount to nearly 22,000,000 cu. yd. and at the end of April nearly 2,000,000 cu. yd. of enrockment and hydraulic fill had been accomplished, at that time about 9 per cent. of the dam was in place.

The service performed by the suction dredge is quite varied. The machines have been engaged on the actual excavation of the prism of the canal at the Atlantic and Pacific termini, where the construction has been proceeding on the ocean bottoms. A style of suction dredge is also being used to excavate, transport and deposit ma-



Fig. 10.—A 95-Ton Bucyrus Shovel Loading Old French Cars.

terial for the great dam at Gatun. Another use is the handling of sand for concrete work. Upon the Atlantic side, there is a large deposit at Nombre de Dios, in Panamanian territory, about 20 miles from the canal. Upon the Pacific side a considerable deposit has been located at Chamé, a small village, also in Panamanian territory. And a large amount, about 1,000,000 cu. yd., will be required for the concrete work at Miraflores and Pedro Miguel. The excavation of this sand, whether on the Atlantic or Pacific sides, is peculiarly a dredging proposition. It will then be seen that there is an enormous opportunity for these machines, quite apart from actual excavation in the prism.

There appears to be some little rivalry between the steam shovels and the dredges. Both are doing splendid work, but under conditions which are quite different. The steam shovel works only 8 hr. per day, while the dredge often works 5½ or 6 days without stopping, and the shovel is often delayed for want of cars in which to deposit its spoil. As to the totals of excavation accomplished by these two types from the beginning of American occupation, May 4, 1904, to the end of April, 1909—five years—the 15 dredges had removed about 28,000,000 cu. yd. of material, and the 100 shovels about 45,000,000.

There are far more shovels at work, however. During the month of April the shovels excavated about 2,100,000 cu. yd., and the dredges about 1,300,000 cu. yd. The relative cost as determined from May 4, 1904, to February 1, 1909, is for dry excavation \$1.24 per cu. yd., and wet excavation 35 cents. These figures include not only labor and administration, but first cost of the equipment. If we exclude the cost of the machines and general administration, the figures are for the two types, respectively, \$0.79 and \$0.12. It will thus be seen that the dredge is much the cheaper excavator.

Steam Shovels.

Steam shovels in quite a variety of sizes are used, ranging up to the 95-ton Bucyrus and the 105-ton Marion machines. Of the 175,000,000 cu. yd. of excavation which will be required to complete the canal from the stage at which the French left it, 105,000,000 cu. yd. is steam shovel work, or 60 per cent.

In Fig. 8 is seen No. 259, one of the 105-ton Marion shovels. In September, 1908, it excavated 45,723 cu. yd. of rock in the Culebra district, having worked 25 days. On the last day of that month it made the high total of 2670 cu. yd. of rock and earth in one day.

On March 2, 1909, a 95-ton Bucyrus steam shovel, No.

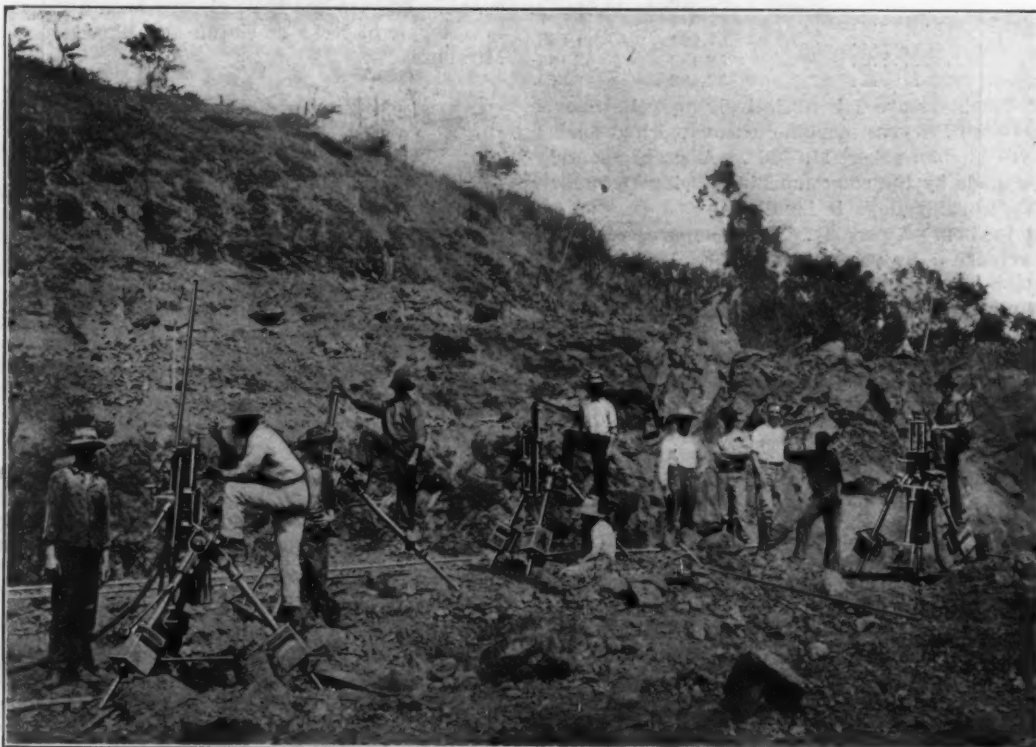


Fig. 11—Sullivan Rock Drills in Bas Obispo Cut.

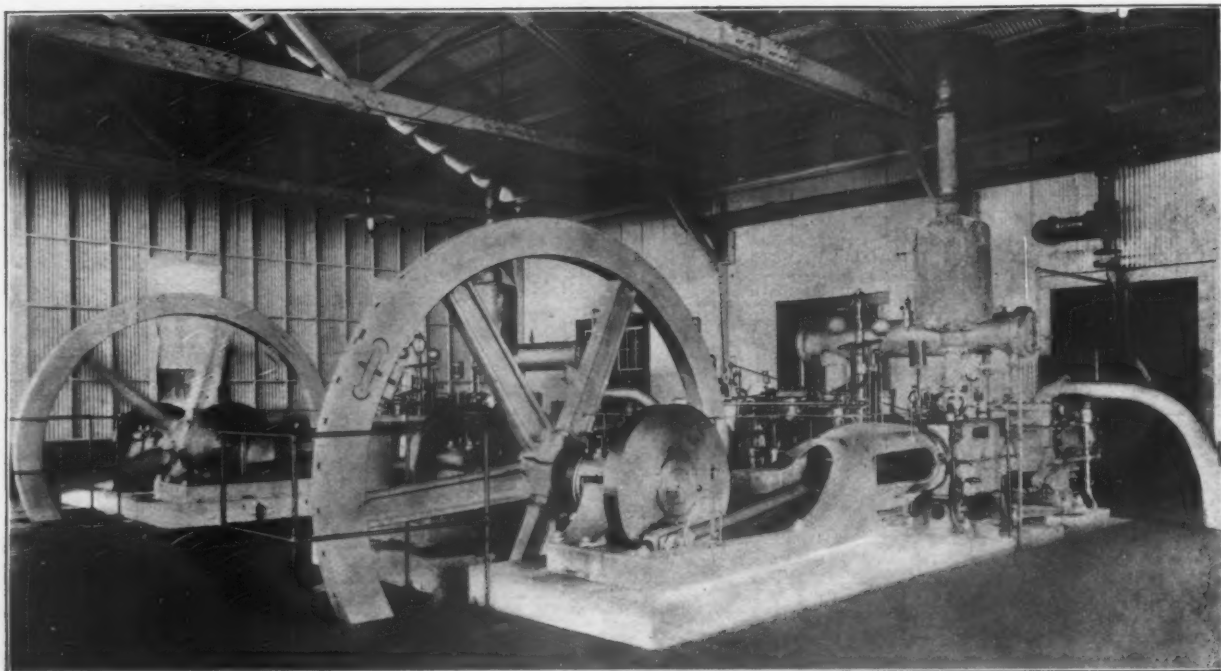


Fig. 12.—Laidlaw-Dunn-Gordon Air Compressors at Panama.

220, made the highest record to that date made by any shovel on the Isthmus. This machine excavated and loaded in a single working day of eight hours 3941 cu. yd. of rock and earth, which is over 8 cu. yd. per min., or more than $3\frac{1}{2}$ cu. ft. per sec. Deducting the time lost by waiting for cars and the like, totaling 70 min., the real record was 9.6 cu. yd. per min., or 4.32 cu. ft. per sec.

A splendid record was made in December, 1908, by another Bucyrus shovel, No. 207. There were 26 working days. The average daily yardage excavated and loaded was about 2390. In detail, the daily amounts were as follows: 2200, 2020, 1931, 2233, 2549, 2496, 1993, 2293, 2191, 2005, 1965, 3005, 2626, 2696, 2410, 2040, 2273, 2175, 2395, 2772, 2254, 2510, 2125, 1520, 2365, 2760. No doubt the American steam shovel is the greatest dry excavator the world has seen. Last October five shovels of the largest type of the Bucyrus machine made the following records.

Shovel No.	Days at work.	Total number of cubic yards.	Daily average.
211.....	26	49,820	1,916
212.....	27	42,044	1,557
206.....	27	47,424	1,756
230.....	27	58,483	2,165
217.....	27	50,493	1,870

Smaller machines are doing relatively as well. Shovel No. 125, a 70-ton Bucyrus machine, excavated and loaded 2520 cu. yd. on November 11, 1908. A great monthly record was made by the same machine during December, when in 27 working days it handled 40,093 cu. yd., an average of 1485 cu. yd. per day. This compares very well with the average daily performance—already referred to—of the 95-ton shovel, No. 212. Eight other shovels of this medium class have made the following monthly records:

Shovel No.	Days at work.	Total number of cubic yards.	Daily average.
131.....	26	34,138	1,313
127.....	26	32,755	1,260
108.....	25	35,754	1,430
135.....	26	23,604	908
112.....	26	33,063	1,472
129.....	24	23,694	987
101.....	26	34,360	1,322
120.....	26	27,893	1,073

This is a monthly average for each shovel of 30,658 cu. yd. In Fig. 9 is shown one of these medium weight shovels engaged in excavating blasted rock. Fig. 10 shows one of the 95-ton Bucyrus machines at work loading a train of little French cars.

March, 1909, seems to have been a very good month for the shovels in general. The best previous record for the average excavation of all the shovels at work in the Central Division (which includes Culebra cut), was 1306

cu. yd. per shovel. Four times during the month this record was exceeded. Thus, on March 24, the average of 58 shovels was 1342 cu. yd.; on the 25th it was 1360 cu. yd. for 57 shovels; on the 30th, 1387 cu. yd. for 56 shovels, while on the 19th, with 55 shovels at work, the average was at the highest level of 1419 cu. yd.

At the end of April, 1909, there were on the Isthmus 102 steam shovels. Of these, 79 are Bucyrus shovels—10 being 45-ton machines, 36 being 70-ton machines, and 33 being 95-ton machines, the largest size made by this firm. The remaining 23 are Marion shovels—one being of the 37-ton size, seven of the 70-ton and 15 of the 105-ton—this last being the largest size made by the Marion people. When the Americans took over the canal in 1904 there seems to have been only five machines for dry excavation possessed by the French. Two of these were Bucyrus shovels and were probably being used to determine the value of the American methods of excavating.

Altogether, the Americans had dredged up to January 1, 1909, a total of 22,661,389 cu. yd. American steam shovel excavation to the same date amounted to 37,111,790 cu. yd. The dredges have already been at work upon the lowest pair of locks at Gatun and likewise upon that at Miraflores.



Fig. 13.—A McCully Rock Crusher Built by the Power & Mining Machinery Company.

The Drilling Machines.

Apart from the track shifter, there has probably been no instance of any machine of considerable application which has been especially designed for use at Panama. Past experience has shown that important advances in mechanical engineering do not reach a high state of commercial perfection at once. There must be a period of development during which the fundamental idea is retained, but which is largely occupied with important changes and modifications necessary to practical success. The drilling apparatus used everywhere along the canal site constitutes no exception to this. These machines are almost indispensable at Panama, and yet they were developed largely in the United States under the incentive supplied by the great mining and engineering operations witnessed in recent years.

Before sinking a shaft or running a tunnel a mining company desires to know the character of the different strata to be encountered. In advance of constructing a bridge the railroad company wants information as to the depth to which it will be necessary to carry pier foundations if a certain site is selected. And so it goes. Before entering upon the expenditure of great sums the engineer seeks by exploratory methods requiring the outlay of small sums to ascertain conditions hidden beneath his feet.

One of the best of all the means for accomplishing this object is the diamond drill. Machines of this class, built by the Sullivan Machinery Company, have rendered such notable service at Panama. The machine derives its name from the fact that the diamond is the cutting agent. It penetrates the strata of rock, cutting an annular hole, leaving a central part called the core. This is brought to the surface in sections of varying length. By preserving these in the order in which they were obtained, the engineer has a very complete record of the rocks through which the drill has penetrated.

The drill proper consists of a tube into whose annular surface at one end six or eight diamonds are set, alternate ones a little to the inside and the others a little to the outside of the annular surface. There will thus be a small clearance between the body of the tubing and the walls of the hole. For very hard rock this allowance may be no more than 1-64 in. on the radius; for softer rock it may be 1-32 in. or more. The diamonds which are used are dark in color, opaque and non-crystalline. They are harder than those commonly used for jewelry and quite expensive, costing about \$80 or \$85 per karat. Each of the diamonds used in a bit will weigh from 1½ to 4 karats. The bit with its face set with diamonds is connected by sections of tubing with the driving machinery at the surface. This apparatus grasps and rotates the whole, with the result that the rock strata are ground through. However, the core at any one moment extends but a short distance upward from the bit. During operation a stream of water is caused to flow down the tubing. This finds an exit from the tubes at the cutting face of the bit. From here it rises through the clearance space and brings the ground rock to the surface. A great advantage of this and certain other drills is that it permits of operation at an angle. It will be seen, however, that the material in which it works must have a considerable degree of hardness, if a core is to be secured. The core drill is the great exploratory instrument. In the exploratory work in the neighborhood of the Miraflores locks and dams 8168 linear feet of diamond drilling was done.

However, for rather soft material the diamond drill is not so well suited. Thus, if the material is sand, the hole will close up when the tubing is withdrawn. And for other reasons connected with the nature of the strata, it sometimes becomes advisable to use a different style of exploratory drill. At Panama the churn drill manufactured by the Keystone Driller Company and operated by Star machinery has apparently been found exceedingly effective for certain classes of work. The principle of operation is that of lifting and dropping a heavy chisel, turning it slightly between blows. A casing is put down to maintain the hole. This is a very old system, and in its original form it is not very valuable

for exploratory purposes. However, not long ago, a method was devised adapting this percussion process to the object of securing a sample. When the depth has been reached where it is desired to investigate, a long hollow chisel is used. By lifting and dropping this tool a quantity of material is forced into it and retained until the tube is brought to the surface. Here it is pushed out and examined or preserved. It has been officially stated, in connection with the investigations of the formations underlying the site of Gatun dam that this method of securing information was the best except that of putting down a test pit. Samples 2½ in. in diameter were obtained by this means.

A third exploratory method has been followed on the Isthmus. Two lines of tubing are employed of differing diameters. That having the less section is included in the other. The outer tubing is for the purpose of furnishing a casing for the retention of the soil. The inner tubing is lifted and dropped and thus cuts a hole. A stream of water is run down the inside of this inner tubing and allowed to rise again to the surface through the annular space between the two lines of tubing, thus keeping the inner tube clear. This water, rising up through the annular space, brings to the surface fragments of the material through which penetration is being made. These are the wash samples. It is perhaps not the best of methods, but has been found very useful at Panama. On the site of Gatun dam the drilling by this method between December 1, 1907, and August 8, 1908, amounted to 26,222 linear feet, as against 3413 ft. of diamond drilling and 398 ft. of other drilling. The rock drills of the percussive type, employed not for exploratory purposes, but for sinking blast holes and the like, are found in great numbers on the Isthmus. The Ingersoll-Rand Company has supplied 284 rock drills of one type or another (See Fig. D on supplement of Part I.) Such drills assist the steam shovels by blasting hard rock, so that it may be handled by the shovels. Fig. 11, herewith, shows Sullivan rock drills at Panama.

The Air-Compressors.

In the first installment of this article Fig. 2 showed a view of Ingersoll-Rand air compressors, as installed at Panama. In the present installment Fig. 12 exhibits air compressors furnished by the Laidlaw-Dunn-Gordon Company. Altogether this concern has supplied the Government with nine of these machines. These are engaged almost, if not quite, exclusively in supplying compressed air for rock drills.

The Rock Crushers.

The enormous amount of small rock that will be required for the Gatun locks makes necessary what will probably be when completed one of the greatest crushing plants in the world. In Fig. 13 is a view of one of the monster McCully crushers built by the Power & Mining Machinery Company for Panama service. The shipping weight of such a machine is 200 tons. Each of the two receiving openings of this machine is 3 ft. wide by about 11 ft. long. It will reduce the blasted rock to pieces of about the size of 6-in. cubes at a rate, it is claimed, of from 600 to 1500 tons per hour. The power required for operation will be about 200 or 250 hp. Of course, the rock will eventually have to be reduced to quite small sizes before it will be suited to concrete construction. This is the work of smaller machines. The Porto Bello plant will have upward of 19 rock crushing machines of various sizes.

The Sea Level Project.

The old Panama Company, headed by De Lesseps, began operations with the expectation of constructing a sea-level canal. The cost and engineering difficulties having been grossly underestimated, this company found itself compelled to adopt a less expensive plan, and so when the end came in 1889 the De Lesseps company was engaged in building a high-level lock canal. The New Panama Company adhered to this change from the original intention. However, neither under the old nor the new company did actual construction proceed so far but that the sea-level design could have been resumed at any moment. The Americans came into actual possession in 1904. In the following year the President named a

board of consulting engineers whose duty it should be to investigate the merits of the sea-level and the lock types. The board in making its report was divided in opinion, the majority favoring the sea-level type, while the minority gave its preference to the high-level plan. In the sequel, the minority prevailed. So much unrest has there been that a second board of engineers was appointed which has, in consequence of the duty imposed upon it, made a personal investigation on the spot. Its report is unanimously in favor of a continuation of the present plan of constructing a high-level canal. In view of the interest which has been aroused it will be of value to consider some of the salient arguments.

There is no doubt that a sea level canal making it possible to sail from one ocean to the other without the necessity of passing through a series of locks is very attractive. The care and maintenance expense that would thus apparently be eliminated would be enormous. Besides, from a military point of view, there would be no locks and no dams to defend from one end of the canal to the other. At first it would seem that once constructed the canal would need but little more attention than the Straits of Magellan. But there are more conditions to consider than would at first appear. Perhaps the greatest single factor in the Panama problem is the Chagres River. The canal route lies right through its valley for a very considerable distance. Whatever plan of construction is followed, this river must be controlled. The sea level canal would not need the water supplied by the sudden floods, but unless adequate means of control were supplied these inundations would be poured into the canal from the Chagres watershed. A dam, and consequently, diversion channels—one on either side—are apparently absolutely requisite as part of a sea level plan. So it is proposed that a dam be erected at Gamboa nearly 200 ft. high. The lake there impounded would, of course, be no part of the canal itself, but, nevertheless, it would menace it. The head of water back of Gatun Dam will be about 85 ft. Consequently the water pressure upon the Gamboa structure would be much greater. The destruction of either dam would be full of terrific consequences. The amount of water, on the other hand, let loose following the destruction of Gatun Dam would probably be vastly greater, for, although Gamboa Lake would perhaps be considerably deeper, its area would be but little more than one-sixth that of Gatun Lake. Three other dams would also be required at other points to control the waters of the valleys through which or adjacent to which the canal runs. So, while the sea level plant would free the canal from locks and their consequent delays to transportation, it would seem to leave the objections applicable to dams practically but little changed. The Gatun Dam is no doubt a very great undertaking, but so is the proposed Gamboa Dam.

The report of the recent commission of engineers provides for the reduction of the height of Gatun Dam from 135 ft. to 115 ft. above sea-level. This has the effect of reducing the margin between the crest of the dam and the ordinary level of the lake from 50 ft. to 30 ft. This is perhaps amply sufficient. The reduction will, of course, reduce the weight over the central portion of the dam very considerably—about 15 per cent. Whether this consideration weighed with the engineers is not apparent from the report. But perhaps the greatest peril at Gatun is the possibility of landslides of the material of the body of the dam. Confessedly this material is slippery, especially when permeated with water. The rock toes, at either side, may prevent such slippage when combined with the gentleness of slope of the general structure.

The depth to which the sea-level plan would require excavation to be extended, and the enormous increase of the cost on this account, and length of time of construction are factors of the problem which the American people could consider negligible, settling the question from a consideration of the engineering problems alone.

The Fairbanks, Morse & Co., Inc., offices at Seattle and Spokane will represent the Woods Drill Works' products in the Pacific Northwest.

Experiments on the Case-Hardening of Steel by Gases.*

Carbon Monoxide Found the Best Gas for the Purpose.

BY J. C. OLSEN AND JOHN S. WEIFFENBACK.

As is well known, for many purposes it is found convenient to use steel having a soft core and a very hard outer layer or case, the hardness of the material being dependent upon the presence of carbon in greater or less amount and held in solution as a result of a process of annealing. If the steel contains a small amount of carbon in the core and a larger amount in the outer layer, the process of annealing will produce a hard case and leave the core soft and tough.

The older methods of case hardening consisted of heating the iron in contact with a great variety of solid material invariably containing carbon in large amount, and, in smaller amount, nitrogen and at times alkaline substances. Charred organic material was usually used such as wood, charcoal or burnt leather; the latter being advantageous because of its high nitrogen content. Such charred organic matter is invariably alkaline from the decomposition of the alkaline salts originally present in the vegetable fibers. Potassium cyanide has also been used. This salt contains the alkali, carbon and nitrogen.

As a result of heating iron in contact with material of this kind, the iron absorbed more or less carbon, depending upon the temperature to which the mixture was heated, the materials present and the length of time of the heating. Investigation has shown that the absorption of carbon is much more rapid from material containing nitrogen and, further, that this nitrogen must be in combination, free nitrogen having no influence on the process. After the proper amount of carbon had been absorbed, the sample was annealed by heating to the proper temperature and plunging into cold water or oil.

Recently the use of gases instead of the solid carbonaceous material has been introduced, and processes of this kind are used commercially to-day. We can find no published record of experiments conducted to ascertain the relative efficiencies of the various carbon gases. This investigation was undertaken to study this question and also to ascertain what chemical reactions take place when the carbon from a given gas enters the steel.

Conditions Under Which the Experiments Were Conducted.

The temperature at which the case hardening must be carried out has been pretty closely determined by previous workers, *i. e.*, from about 700 to 900 degrees C., or 1300 to 1700 degrees F. It has also been ascertained that if the case hardening is carried out with gases subjected to a certain amount of pressure the action is much more rapid. This was to be expected, inasmuch as the carbonaceous material is in this manner concentrated in the vicinity of the surface of the steel, that being the only place where action can take place. We have used in our experiments† the following gases: Illuminating gas, as supplied in Brooklyn by the gas companies, methane, carbon monoxide and acetylene. The illuminating gas of Brooklyn contains on the average about 26 per cent. of carbon monoxide, the same percentage of hydrogen and methane, about 12 per cent. of "illuminants," consisting of ethylene, acetylene and benzene, and smaller proportions of free nitrogen, oxygen, carbon dioxide, &c. The acetylene was that used in automobiles for lighting purposes. As 98.5 per cent. of the gas was absorbed by bromine it was considered sufficiently pure. The other gases were made in the laboratory and were very nearly pure. The carbon monoxide was made by decomposing oxalic acid with sulphuric acid and absorbing the carbon dioxide by means of strong caustic potash solutions. The

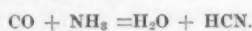
* Read at the Brooklyn meeting of the American Institute of Chemical Engineers and presented for publication in the *Transactions* of the Institute.

† The authors are under obligations to the American Gas Furnace Company for the use of one of its furnaces during these experiments.

methane was made by heating a mixture of sodium acetate and soda lime in a copper retort.

Experiments were carried out with each gas alone and mixed with a definite amount of ammonia gas. The ammonia gas was mixed with the carbon gas by bubbling the latter through Wolff bottles containing an aqueous ammonia of definite strength. The amount of ammonia introduced into the gas was ascertained by allowing a liter to pass through a definite amount of standard sulphuric acid and titrating back the excess of acid with standard alkali. The percentage of ammonia gas was then calculated. Three strengths of ammonia were used, as follows: (a) 125 cc. of 28.5 per cent. ammonia with 875 cc. of water; (b) 250 cc. of the strong ammonia with 750 cc. of water, giving (b) double the strength of (a); (c) 500 cc. of strong ammonia and 500 cc. of water, giving ammonia twice the strength of (b) and four times the strength of (a). It was found that when gas was bubbled through the weakest ammonia (a) it contained 2.28 per cent. of ammonia gas. When bubbled through (b) it contained 4.8 per cent., while with (c) 11.4 per cent. of ammonia gas was found in the resulting mixture.

Experiments were first carried out with the illuminating gas to ascertain if the ammonia would combine with the carbon monoxide or other carbon gas present to form cyanides or cyanogen, it being thought that the following reaction might take place:



For this purpose the mixture of ammonia and illuminating gas was passed through a glass tube, which was heated in a combustion furnace to the case hardening temperature, 800 degrees C., or 1500 degrees F. The temperature was measured by means of Seger cones and pieces of potassium and sodium chloride. The sodium chloride melts at 804 degrees C. The potassium chloride melts at 772 degrees C. Seger cone No. 17 was used.

The mixed gas after passing through this tube was allowed to bubble through caustic soda solution, and cyanides were tested for by the well-known and very delicate Prussian blue test, ferric and ferrous iron being added and the solution then acidified with hydrochloric acid. No test whatever for cyanides was obtained. It was thought that cyanides might be formed in the combustion tube and then decomposed so that no test would be obtained in the caustic soda solution. Another experiment was therefore made to ascertain if hydrocyanic acid could exist at the temperature of the glass tube. For this purpose a flask containing a small amount of potassium cyanide and a little sulphuric acid was introduced, so that the gas bubbled through this flask before entering the heated glass tube. A test made for cyanides on this gas on leaving the hot glass tube gave a very excellent test of cyanides. It was concluded, therefore, that the ammonia did not react with the constituents of illuminating gas to produce cyanides. We have not ascertained how ammonia assists in the case-hardening process.

We next conducted an experiment to ascertain what portion, if any, of the ammonia was decomposed when the mixed gases were heated to the annealing temperature. For this purpose the illuminating gas mixed with ammonia from solutions (a), (b) and (c) was passed through the hot glass tube and the following results were obtained:

ment.	Amount of NH ₃ gas per liter used in experiment.	Amount of NH ₃ gas per liter after being heated to 1500° F.	Amount of NH ₃ gas per liter decomposed by heat of 1500° F.
IV(a)	22	19.8	2.2
IV(b)	48.4	22.0	26.4
IV(c)	114.4	70.4	44.0

The Actual Case-Hardening Experiments.

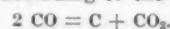
The actual case-hardening experiments were carried out on samples of soft Norway iron containing only 0.08 per cent. of carbon. This iron was purchased in rods 1 cm. in diameter, which were cut up into 6-in. lengths. A common gas pipe was used for the case-hardening. It was heated in an ordinary combustion furnace, the tem-

perature of 1500 degrees F. being maintained throughout the experiment. The percentage of carbon in the iron both before and after case-hardening was determined by dissolving the iron in cupric potassium chloride and oxidizing the undissolved carbon by means of chromic anhydride and sulphuric acid, absorbing the resulting carbon dioxide in caustic potash and weighing. The samples for analysis were obtained by turning off the outer layer of metal on the rod in a lathe. On many of the samples this was impossible on the annealed and hardened sample, but on drawing the temper it was found a simple matter to obtain samples. The depth to which the carbon penetrated was obtained by breaking the rod and measuring the hard case by means of a microscope fitted with an ocular micrometer. The results were as follows:

Summary of Experiments V to XVII.

Experi- ment.	Gas used.	Time.	Hard- ness.	Carbon Depth compo- of case. sition.	
				Mm.	Per ct.
V.	Illuminating NH ₄ OH(a)...	4	Glass.	0.1	0.57
VI.	Illuminating NH ₄ OH(b)...	4	Glass.	2/30	0.665
VII.	Illuminating NH ₄ OH(c)...	4	Glass.	2/30	0.915
VIII.	Illuminating	4	None.	None.	None.
IX.	Illuminating NH ₄ OH(a)...	8	Glass.	3/10	1.12
X.	Illuminating NH ₄ OH(b)...	8	Glass.	3/10	1.16
XI.	Illuminating NH ₄ OH(c)...	8	Glass.	3/10	1.15
XII.	CO NH ₄ OH(c).....	4	Glass.	4/10	1.45
XIII.	CO	4	Glass.	4/10	1.36
XIV.	CH ₄ NH ₄ OH(c).....	4	Little hardness, defined.	Not well	0.32
XV.	CH ₄	4	Little hardness, defined.	Not well	0.26
XVI.	CH NH ₄ OH(c).....	4	Glass.	3/10	0.98
XVII.	C ₂ H ₂	4	Little hardness, defined.	Not well	0.41

A few experiments were carried out to ascertain the chemical reactions taking place during the carbonizing. In the case of carbon monoxide the gas was freed from carbon dioxide by bubbling through strong caustic potash solution before entering the case-hardening tube. On emerging from this tube a considerable amount of carbon dioxide was found present. The carbon monoxide must, therefore, break up according to the following reaction:

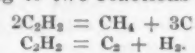


With methane the reactions take place according to the following equation:



This was ascertained by analyzing the gas emerging from the case-hardening tube by mixing with air and passing over palladium sponge, 9.45 per cent. of hydrogen being found.

The acetylene gas apparently breaks up during carbonization according to two reactions as follows:



and

This was shown by the fact that the gas after carbonization contained no acetylene at all, but contained a large amount of hydrogen and also methane. A large deposit of carbon was also found in the tube.

It is evident that ammonia gas facilitates the case hardening in all cases except that of carbon monoxide, which seems to act almost as well without as with ammonia. Of the three gases studied the carbonizing ability is in the following order: Carbon monoxide, acetylene, methane. Carbon monoxide, therefore, is by far the best gas for this purpose, as no ammonia seems necessary and it gives the best penetration in the same time.

The Pittsburgh Gage & Supply Company, Pittsburgh, has received a contract from the Massillon State Hospital, Massillon, Ohio, for 12-in. steam and exhaust lines used in connection with high pressure piping which takes in heater, pumps, &c., in the new addition to its boiler house. Turner & Serrell, Philadelphia, have also contracted for a White Star oiling system for use with a Frick ice machine, while orders for other White Star oil filtering systems include one for the United Ice & Coal Company, Harrisburg, Pa.; a No. 250 unit for the National Tube Company's McKeesport plant and a No. 23 filter and accessories for continuous system for the Pittsburgh & Conneaut Dock Company, Conneaut, Ohio.

Copyright in Drawings of a Technical Character.*

BY D. A. USINA.

The copyright law enacted March 4, 1909, to go into effect July 1, 1909, contains provisions which may be of great importance to engineers, in that it provides specifically for copyright on "drawings (or plastic works) of a scientific or technical character," and in that the securing of the copyright is made an extremely simple matter.

Prior to the passing of this law there has been no certain protection against the pirating of designs for engineering structures. Where a design, though new, has involved only the skill of the engineer, it has been unpatentable, and unless the work could be classed under the fine arts there has been no reasonable hope of protection by copyright. In many cases designs involving a high degree of engineering skill and gotten up at great expense have been copied by others with no moral justification whatever. National, State and city governments and private parties have asked for bids to be accompanied by original designs and have appropriated the design of one bidder and let the contract to another—a species of piracy distinguished legally, but not morally, from the piracy of works of literature or the fine arts.

It is hoped that the new law will put a material check on such practices by reserving to the proprietor of such drawings the sole right of printing or copying them. It is doubtless if the law can be invoked to prevent the building of the structures shown in such drawings, with the possible exception of works which might be classed in the fine arts. The limitations which can be put upon the use of the drawings, however, should afford a substantial degree of protection, and the ease with which copyright can be secured makes it undoubtedly worth trying for whatever protection can be secured.

The language of the act relative to technical drawings is as follows:

That the application for registration shall specify to which of the following classes the work in which copyright is claimed belongs: . . . (4) Drawings or plastic works of a scientific or technical character.

Taken in connection with the remainder of the law, there is little or no doubt that this language was intended to render such drawings copyrightable. The view of the Register of Copyrights is

that the language of the act would authorize the deposit and registration in this office for copyright protection of drawings of a scientific or technical character such as under the present law would not be included in the term "drawing," which seems to be confined to artistic drawings. Examples of such works would be drawings for machinery, for engineering construction, for architectural works, &c. While these drawings have to some extent been registered in the Copyright Office heretofore, it has always been a question whether the law authorized the registration and whether copyright protection would follow.

Protection is extended to "all the copyrightable component parts of the work," such for example as the drawings relating to any complete and mentally segregable part of the whole structure.

Procedure in Copyrighting Drawings.

Copyright is secured by publication with the required notice affixed to each copy; or, where "not reproduced for sale," by depositing a photograph or other reproduction with the Register of Copyrights. But engineering drawings are usually offered for sale (as part of the bidder's work), and, in such cases, the copyright is secured by affixing a notice of copyright; and after thus securing the copyright there must be promptly deposited in the copyright office two complete copies.

Several permissible forms of notice are provided. It is sufficient if the word "copyright" be applied to each sheet of drawings, together with the name of the proprietor and the date. It is customary now to apply the name and date to drawings; and the addition of the word "copyright" is the simplest matter in the world. For what it is worth (and apparently it will sometimes

be worth much) the word "copyright" should be added to all original drawings and copies thereof.

In the case of drawings of especial value it is advisable also to deposit copies promptly with the Register of Copyrights and to secure a certificate of such deposit, so as to obtain the apparent sanction of the government and to indicate such fact on the face of the drawings. For drawings of less value the depositing of copies may be delayed until it is thought necessary to threaten or bring suit for infringement. The securing of copyright is probably effected by the mere notice. The deposit of copies is an additional formality which, though required to be made "promptly," and, though a necessary preliminary step before a suit for infringement can be brought, does not seem necessary to the securing of the right.

Copyrighted works may be sold or furnished to others with any reasonable limitation upon their use. For example, a bidder may furnish an original design with a notice of copyright and a special notice that the copyright and the copies submitted constitute parts of the bid and remain the property of the bidder in case his bid is not accepted, and that the design is not to be copied or submitted for bids from others.

Cases Involving the Government.

An interesting feature of the new law is the apparent sanctioning of actions against the United States and its officers; but much weight cannot be placed on this construction, in view of the broad prohibition in the general law against actions "sounding in tort" against the United States. Congress has provided no remedy for wrongs committed by the national government, except for violations of contract, express or implied. The provision of the new law bearing on this subject relates specifically to the recovery of costs in suits for infringement and states that in such suits,

except when brought by or against the United States or any officer thereof, full costs shall be allowed, and the court may award to the prevailing party a reasonable attorney's fee.

It is unnecessary to consider the question here at length, but it may be stated generally that after a tort is committed by the United States there is no adequate remedy, but an injunction may be secured against a repetition of it; and perhaps, if one has sufficient notice of an intention to infringe the copyright, such infringement can be enjoined in the first instance. Possibly the framers of the law had such injunctive proceedings in view when they framed the above section exempting the United States and its officers from the payment of costs.

The act provides also that "any person who wilfully and for profit infringes a copyright may be punished by a fine and imprisonment; and an infringer who had received such a special notice as is above referred to would be infringing wilfully and for profit, and would hesitate to run the danger of fine and imprisonment.

Under the old copyright law there were only a few cases in which it was attempted to secure a copyright upon a purely technical drawing. It was necessary to enter the drawings in the office of the Librarian of Congress, and the Register of Copyrights permitted such entry only under protest and was of the opinion that such drawings were not copyrightable. The validity of the copyright was generally doubted. The new law, which specifies such works particularly as one of the classes in which copyright may be claimed, and permits the securing of the copyright by applying to the drawings a notice that copyright is claimed, is a material advance toward the protection of a kind of intellectual property of far greater dignity and usefulness than circus posters and similar matters, to which the previous law had extended protection. To quote the language of the Constitution, upon which is based the power of Congress to make a copyright law, technical drawings do more "to promote the progress of science and useful arts" than many of the classes of work heretofore provided for.

The practical value of the new law to engineers cannot be predicted. We can only hope. It cannot be used to protect functional equivalents of the thing represented by the drawings. That is the purpose of the patent law, and protection thereunder runs for 17 years only, while copyrights may last 56 years. It is quite possible for

* From the *Proceedings* of the American Institute of Civil Engineers, May, 1909.

the courts to construe the new law so narrowly as to destroy its value. But it will probably be construed so that it will protect the engineer against the copying by others of the substance or of any material part of his original designs.

An Interesting Driving Axle Failure.*

BY M. H. WICKHORST.

The failure of the locomotive driving axle reported below is interesting and somewhat unusual, being a case of an axle failing because of a crack developing internally, and probably also instructive as showing some of the precautions that seem to be necessary in selecting billets from which axles are made. The axle that broke was a crank axle of a balanced compound Atlantic type engine, with an original diameter of 9½ in. The axle was applied at the West Burlington shops, Chicago, Burlington & Quincy Railroad, May 25, 1906, and broke while the engine was hauling a passenger train July 29, 1907. As stated, this was a crank axle and broke in the middle of the journal under the left driving box. Fig. 1 is reproduced from a photograph of the fractured surface, from which it will be noted that the old crack existed very largely inside of the axle; and it would seem not improbable from the looks of the fracture that the crack first started inside, continuing both outward and inward.



Fig. 1.—Fractured Surface of a Broken Crank Axle from a Burlington Locomotive.

although the point of the beginning of the fracture must be said to be uncertain. An analysis of borings taken near the point of fracture at the outside of the axle showed the following results:

	Per cent.
Carbon	0.53
Phosphorus	0.036
Sulphur	0.011
Manganese	0.43

This analysis is normal for driving axle steel, although perhaps the carbon is a trifle high. An etching of the section near the point of fracture is shown in Fig. 2. This shows sound material, with no indication of piping, but the center portion is seen to consist of very large crystals, some of them ¼ to ⅝ in. long. This would seem to indicate that the billet was rolled from the ingot before the steel had a chance to solidify in the center, leaving the process of crystal formation to go on even after the work of rolling the billet had been finished. The figure shows definitely that later, when the billet was forged into an axle at West Burlington, the work of forging affected the metal to only a short distance, averaging not much over 1 in. from the outside. We had intended making a full examination of the main portion of the axle, but unfortunately this had been

scrapped by the time we finally decided to make a further examination. It seems evident that in forging there was a rectangular core that was but little affected by the hammer, which left severe forging strains, which



Fig. 2.—Etching of a Section of the Same Axle, Near the Point of Fracture.

latter resulted in the internal crack. Fig. 1 shows this crack to have a roughly rectangular shape, indicating the location of the strains.

It has frequently been urged that in buying billets for forgings it is only important to know that the chemical composition of the material is satisfactory and that the process of forging afterward furnished the necessary work to produce suitable physical properties in the finished forging, and the author has been somewhat partial to this view. This experience, however, seems to show fairly definitely that it is important to have the necessary physical qualities in the billet before the forging is made, and it would seem advisable, therefore, to make physical tests of the billets, obtaining the test piece by means of a hollow drill or otherwise.

The Allegheny Steel Company Buys the Reliance Tube Company.—The Reliance Tube Company, Ltd., Renshaw Building, Pittsburgh, with works at Brackenridge, Pa., adjoining the plant of the Allegheny Steel Company, has been taken over by the latter. The Reliance Company was owned and operated for a number of years by Charles Bailey, Joseph A. Kelly and C. C. Henderson, its product being steel and charcoal boiler tubes, and it had a prosperous business career. Messrs. Bailey and Kelly will not be actively engaged in the new company, but Mr. Henderson continues in an executive capacity. The Allegheny Steel Company manufactures a line of plates, steel sheets, &c., and it proposes to give the same attention to its new line as it has to the former operations. The formal transfer of the tube mill will not interfere with its activities in any way.

The Seaman-Sleeth Company, operating the Phoenix Roll Works, Pittsburgh, has received a contract from the Algoma Steel Company, Sault Ste. Marie, Canada, for the complete equipment of rolls required for the latter's new 12 and 18 in. structural shape mills, which will be electrically driven. The contract includes the designing and the making of the rolls.

Reports that the Republic Iron & Steel Company had recently bought a large tract of land on the lake front near Gary, Ind., for the purpose of erecting blast furnaces, steel works and finishing mills are absolutely untrue. The company has not bought any land in the vicinity of Gary and does not contemplate doing so.

* Read before the American Society for Testing Materials, Atlantic City, N. J., July 1, 1909.

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How the Ironmaster Has Promoted Peace.

The industrial progress of the world in the past century has been most prominently in the extension of the beneficent uses of iron and steel. The ironmaster has furnished the means for plowing, planting, reaping, preparing and transporting the great commercial harvests; he has covered the world with a network of highways of steel; he has furnished the motive power, the machinery and nearly all the equipment of the countless factories which afford employment for the people, and has replaced the brick of Babylon and the marble of Greece with great structures of steel, which house under one roof the population of a small city. Copper has taken an important place in the industrial development of the world, but copper alone creates no energy or wealth. It merely transmits the energy of the engine or water wheel, and the one indispensable part of the dynamo or electric motor is the magnetically charged core of iron.

A curious fact in the history of iron is that for 3000 years or more it was doubtful whether the metal was a blessing or a curse to mankind. It is only within the past century that the beneficent uses of iron and steel have become more important than the destructive use of the metal in warfare and strife. The Dark Age of Europe followed directly upon the discovery of steel, just as the earlier Dark Age of Egypt and Western Asia followed the extension of the use of bronze in that ancient world. If industry is at last triumphant in its contest with the sword, it is because the modern ironmaster has so cheapened the cost and multiplied the production of iron and steel that the sword or the metal from which to forge weapons is no longer monopolized by military caste.

For thousands of years after bronze was discovered it was a rare and costly metal, more valuable than gold. Copper was found everywhere, but the tin that hardened it and made it suitable for use in tools and weapons was brought from a far distant, unknown country and was easily monopolized by the ruling classes of ancient empires. It was too valuable a metal to use in agriculture or any other base art, but a small army equipped with weapons and shields of bronze could enslave an empire of people who had no weapons but wood and stone. The valleys of the Nile and the Euphrates were populous in ancient times because their sandy, friable soil could be cultivated with wooden implements and gave quick returns to agricultural labor. The earliest historic empires were located in those valleys because they were the only places in the world of any notable magnitude where

agriculture could be carried on successfully without iron; and their people fell an easy prey to the sword and became the slaves of Pharaoh and the Chaldean and Babylonian kings. The ruins of those ancient empires show that their earliest civilization was the highest and that during thousands of years there was a progressive decline, until they sunk into hopeless decay. The power of the sword in the course of ages paralyzed industry and progress and reduced the masses to a dead level of hopeless slavery under the heel of a small governing class who despised industry.

In Europe the same progressive decline is found during a period of about 2000 years—from the highest development of art and industry in Greece and Carthage to the end of the Dark Age. This decline was inaugurated by the discovery of steel. Iron was known and used at least 1000 and perhaps 1500 years before the Christian era, but until the process of carbonizing and tempering it to make steel was discovered it was inferior to bronze for tools or weapons, and the supply was so limited that, as late as the fourth century B. C., Greek historians record the fact that iron and bronze exchanged for equal weights of gold. The Romans in their wars with Hannibal carried bronze swords and shields, and their legions were not equipped with steel swords until the middle of the second century B. C. Hannibal's army of Carthaginian mercenaries was the first of which there is any historical record in which steel replaced bronze in warfare, and it was his superiority in weapons that enabled Hannibal to carry on his long campaign against the Romans.

When the Romans obtained possession of the forges and mines in Spain, where the Carthaginians had developed the art of making steel, they lost no time in equipping their legions with the superior metal. Until that time they had made little progress in their predatory campaigns outside of Italy, but within a century after they had armed their legions with steel they had destroyed Carthage, sacked Greece and brought all Europe and Western Asia under tribute to Rome. The Greeks and Carthaginians were industrious, commercial peoples and their colonies had created and developed the civilization of Southern Europe and the Mediterranean; but the Romans sought only plunder, tribute and slaves. In their hands the sword once more obtained the mastery of the world and began its work of destroying, by predatory taxation and oppression, the wealth that had been created by industry. History fails to record during the next thousand years any notable invention or industrial discovery, and Rome, like Egypt and Babylonia, declined until she could no longer defend the remnants of her civilization against the hand of the barbarian invader. Slaves do not make useful or labor saving inventions nor burn the midnight oil in seeking scientific discoveries.

Tacitus, in the first century of the Christian era, records the fact that the Germans had scarcely enough iron to tip their spears. The northern races made no progress against the Roman legions until they had obtained enough steel to place them on an equality in weapons. Once masters of Europe, the few who could afford to clothe themselves in iron armor became barons and established a system of petty and oppressive taxation which destroyed the remnants of industry. A famous historian has explained that England had a monopoly of the European supply of wool in the Middle Ages because the islands enjoyed internal peace, while the barons on the Continent were engaged in almost continual strife, which made it impossible for them to raise sheep.

During the past century the iron master has convinced the world that the individual man can profit more by patient industry than by predatory warfare. The old wooden plow with a scant iron point, which was only superseded within that recent period, did not promote peace of mind in the unhappy mortal who had to use it, and the hoe and the sickle made aching backs and a desire for any change, even war, that might improve the unfortunate lot of the tiller of the soil. Modern iron and steel plows, harvesting machines and other labor saving implements have made it possible for the farmer to acquire wealth by his own labor, with all the comforts that wealth commands. Highways of steel have promoted commerce and created unlimited opportunities for profitable employment for millions of men who in former centuries chafed under the restraints and hardships of serfdom or slavery. We can scarcely realize that so short a space of time separates us from the long era of human history, extending backward into the mists of prehistoric time, when warfare and strife were the chief occupation of man and peaceful industry was shunned by all save those who were forced to labor. Yet in this short transition from predatory warfare the dominant races have realized so clearly the advantages of peace that the millions of men who carry on the world's commerce and industries command practically unanimous support from the masses when they sternly repress any political ambitions in the minds of their rulers that might lead to war again. The iron master has brought peace to a troubled world by providing the means which make labor profitable and interesting to the individual.

Some Results of a Premium System.

One of the initial results of a shop premium system is the revelation that many points where production could be cheapened had been overlooked. The workman, becoming a partner in any saving of labor cost, is stimulated either to disclose possible economies of which he had been aware or to put his brain to work devising ways of cheapening production. One of the large machine tool manufacturers has recently adopted the system and has already discovered numerous cases where the time of manufacture could be reduced, not alone through the greater zeal of workmen—itsself the greatest factor—but in better methods of doing the work and in the elimination of wastefulness of labor. For instance, a planer hand who had been planing beds for a long time made complaint soon after the system went into effect that a boss surrounding a door opening was made too deep in the casting, requiring unnecessary planing; the bed patterns called for too much iron, which had been planed off in many beds, instead of being removed in the pattern. Again, a boy on a splining machine pointed out that the toolroom was furnishing him with cutters that precluded the possibility of their use in multiple. Incidents such as these have been constantly coming to the attention of the shop management. It may be argued that the faithful, efficient workman should keep his wits about him under any system of wages and should have found out and reported these things before, but the great majority of men, in the shop and out of it, work better under a stimulus.

In establishing the premium system in the shop in question the rule was made that the base price, that is to say, the limit of cost below which the workman must get in order to receive a premium, shall stand, no matter if it prove to be much too high. If 20 cents is fixed for a given part, and it develops that the actual cost is 5

cents, no change will follow, unless, of course, the difference comes from improved equipment. The saving, represented by the difference between the base price and the actual labor cost, is divided equally between the company and the workman. The base is found by careful study of the cost records.

The theory of this establishment is that a strict adherence to the agreed base is an imperatively necessary feature of the premium system, and we believe this has come to be the general opinion of those who have tried it. In general practice an occasional instance may arise where the discrepancy is so great as to warrant correction, but according to this opinion a workman should never be permitted to feel that if his efforts produce too great a saving he will be a sufferer in the reduction of the base price. This is the common fault of the piece work system, and a workman is consequently always striving not to reach maximum production, but rather for the maximum which will not incite the employer to cut the price. Under the system where the employer and employee divide the saving there is no great loss to the former if the difference between base and actual cost is great. It is claimed to be insignificant as compared with the results of the constant scheming of men not to let their production get too high. The employer not only shares in the saving, but his machinery produces more, lowering the overhead expense. It is confidently stated that a change from the ordinary wage system to a properly conducted premium system is the equivalent of a considerable increase in equipment. The shop above referred to is producing more machines with a smaller force of men than it was before the depression, and the management has no doubt that the premium system is a conspicuous factor in this bettered condition.

The American Automobile Output for 1910.

The estimate of General Manager Alfred Reeves of the American Motor Car Manufacturers' Association that plans for 1910 call for the production of 200,000 cars is suggestive of big things in the effect upon general trade. The output for 1909 will be 70,000 cars, so that if the estimate for 1910 is realized the increase will be phenomenal. Mr. Reeves states that the figures may not be reached, because it may be impossible for the builders to accomplish the feat, but he claims a sure increase of 125 per cent. on the present year. The automobile business appears to be on a sound footing. Its organization has effected an agreement which precludes the possibility of disastrous losses due to unwarranted credits. Consequently so radical an advance in production does not seem so dangerous as it would have been when competition included the giving of discounts to customers and the acceptance of their notes for a large part of the purchase price. Therefore, those of whom the automobile trade is a customer may look forward to the outcome with complacency.

It is realized everywhere that with the present rate of production the automobile trade has been the best of all the buyers in the machinery market for the last two years, and this affords the basis of some understanding of what the influence will be when the output is much more than doubled. The customer that proved a main support in dull times should occupy an equally conspicuous place in good times. The steady increase of manufacturing space and equipment must go on without interruption, not only among the automobile builders themselves, but with the makers of parts and accessories in myriad variety. The value of cars alone, averaging

\$1200, will approach \$200,000,000, but the initial cost of a car is only the beginning of expenditures, which continue in the form of replacements, repairs, accessories and supplies. Practically all the automobile factories are building additions or otherwise providing for increased output. The effect upon the machine tool trade will be important, for there is already a dearth of certain machines which the automobile people make large use of. It is believed that standard types will have to be resorted to later to take the place of more special equipment, which will be impossible to obtain except for distant delivery.

Mr. Reeves' estimate is based on figures furnished him by 80 of the leading automobile builders, together with reports of the manufacturers of parts. He does not include some 25 concerns which build cars, nor those which are just coming into existence and the success of which is problematical. The largest estimate of an individual factory is 30,000 cars for 1910; then comes one of 20,000 to 25,000; a third follows with 12,000; two are put down for 10,000 each, while dozens of others run from 1000 to 8000. The only obstacles reported by the manufacturers as standing in the way of the full 200,000 output is the possible inability of manufacturers of parts to supply so great a demand. It may be well to take into account the enthusiasm of a trade which has succeeded while practically all other lines were dull, but, even making a large correction for possible overoptimism, it appears certain that next year will far exceed all others in this now great industry.

CORRESPONDENCE.

The Duty on Scrap Iron.

To the Editor: In *The Iron Age* of June 24 your Washington correspondent furnishes an article on the metal schedule, and publishes a letter on the rates on ore and scrap from Rogers, Brown & Co., commission merchants, Cincinnati, Ohio. We must take exception to the last clause of their letter in reference to the scrap iron schedule, in which they say:

The reduction of 50 cents per ton has apparently been brought about by a few consumers in the East, who get protection on their manufactured output, but who desire to get their so-called "raw material" free.

We believe the East has no more protection on manufactured products than any other section of the country, but all receive the same protection alike under the Dingley tariff. What we are interested in is the reduction of the duty on scrap iron and scrap steel, and for these reasons:

1. The Dingley tariff of \$4 per ton on imported scrap is a prohibitive duty, as the Government could get no revenue from this source on account of this high duty.
2. The Canadian duty on scrap shipped from the United States into Canada is \$1 per ton, and we find in New England that scrap iron is being exported to Canada under this duty.
3. The very large increase in the number of open hearth furnaces for the manufacture of steel has caused a greater demand than ever before for scrap iron and scrap steel; and the low export duty of \$1 per ton to Canada has caused a condition that makes the independent mills, who are dependent on this material for their supply, very seriously handicapped.

The statement which is made that scrap iron is used in the place of pig iron is misleading. Most of the independent mills use scrap iron and scrap steel, and do not use pig iron. We do not believe that scrap iron should carry the same rate of duty as pig iron; scrap iron is a waste product and pig iron is not.

The independent mills asking a reduction on scrap do so because they believe a lower duty is necessary to enable them to obtain a sufficient supply of material to operate their mills in competition with the larger cor-

porations by importing scrap when necessary. The demand for a lower duty is not confined to a so-called "few Eastern manufacturers," but extends on the Atlantic coast from Maine to Philadelphia and as far west as Pittsburgh, Pa.

PORTLAND IRON & STEEL COMPANY.

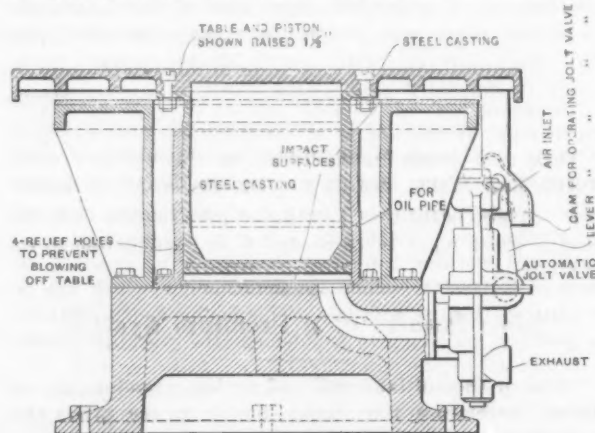
By ROSWELL M. BOUTWELL, Treasurer.

BOSTON, MASS., June 29, 1909.

Jolt Ramming Molding Machines.

To the Editor: The publication in *The Iron Age*, June 24, of the communication from Wilfred Lewis of the Tabor Mfg. Company, in which he refers to a patent issued to him on the construction shown in the description of a jolt ramming machine in *The Iron Age* of June 17, gives, I believe, too much importance to a questionable design of the jolt ramming machines.

The function of the jolt ramming machines which are now so rapidly growing in favor is to raise half molds upon which they are operating as economically as possible and drop them as effectively as possible on an anvil, the impact upon which sets the sand around the pattern. One of the drawbacks, and perhaps the only serious one, of this method of ramming molds is the effect upon foundations and surrounding shop floor. This effect is directly proportional to the falling mass and to the square



Vertical Section of One of the Latest Mumford Jolt Ramming Machines.

of the velocity at impact. The falling mass is made up of the mold and its patterns upon the table of the machine, the table itself and either the cylinder or plunger of the machine, according to which of these is raised by the operating air.

One need go no further than to consider that a moving cylinder in a jolt ramming machine is necessarily heavier than a moving plunger of the same diameter, even were the plunger made of the same material and of equal thickness; but, to make matters worse, the construction which Mr. Lewis has patented involves an unusually massive cylinder element having heavy ribs running from the bottom end of the cylinder at wide angles to support as large a table surface as can be supported by this method.

It would be assuming too much to name a percentage of power lost or floor shock increased by this wasteful design, but it seems only fair to the many foundrymen about to purchase jolt ramming machinery to call attention to the fact that every pound of unnecessary dead load lifted and dropped by the compressed air they furnish to a jolt ramming machine involves a waste of power, while it represents a useless mass falling upon the anvil of the machine and shaking the surrounding foundry.

The idea of jolt ramming is so old that we do not believe that anything of value has been patented in recent years or can be broadly patented now in this particular line, but in the design of the Mumford jolt ramming machines cast steel plungers of the lightest possible sections are employed, bolted to cast steel tables, also of the lightest sections consistent with strength, and in these machines the falling parts are not cumbered with stiffness they do not need until the instant of impact, at which time they impact upon practically their entire horizontal area, the plunger upon the bottom of the cylinder,

the table upon an impact ring of the shape of the table, regardless of what that may be, surrounding the cylinder but independent of it.

Incidentally, we may say that this construction will be covered by a patent to E. W. Huggins, but for fear that what I have said may not be clear to your readers we inclose herewith section through one of our latest machines, showing this essential feature of design, and hope you will consider it a communication of sufficient interest to merit the sacrifice of some of your valuable space.

E. H. MUMFORD COMPANY,
By E. H. MUMFORD, President.

PHILADELPHIA, June 25, 1909.

The Reorganization of Milliken Brothers, Inc.

The plan for the rehabilitation of Milliken Brothers, Inc., New York, which has been in the hands of receivers for two years, has received the approval of 86 per cent. of the stockholders and 76 per cent. of the creditors. The plan was drafted by a committee of creditors appointed in December, 1908, of which Gates W. McGarrah, president of the Mechanics' National Bank, was chairman, and provides for the retention of the present mortgage indebtedness of \$3,000,000, consisting of first mortgage convertible 6 per cent. bonds, while the \$3,000,000 7 per cent. cumulative preferred and \$1,500,000 common stock are to be deposited with voting trustees.

Creditors are to receive 10-year promissory notes, which may, at the option of the committee, be changed to registered bonds upon depositing their claims with the Bankers' Trust Company. The statement as assets as of April 21, furnished with the plan, shows cash on hand amounting to \$508,333, and it is proposed to raise additional working capital, if necessary, by creating an issue of \$2,000,000 second mortgage bonds which are to be pledged to raise \$400,000. This is the amount figured as possibly necessary to supplement the working capital accumulated by the receivers.

It is proposed that the second mortgage bonds, if issued, shall be used to secure short term notes, but the committee has the right to sell a portion or all of the bonds if favorable terms are obtainable, and to redeem the bonds at any time at par and interest on 30 days' notice. All creditors receive the right to participate in the loan or to purchase bonds. The promissory notes are to receive 5 per cent. interest when earned and payment on account of principal as the directors may be able to make it.

The plan for the sale of the company gives power to the voting trustees to sell the stock. If such a sale should be made, the proceeds are to be devoted pro rata to the payment of the promissory notes or second mortgage bonds and the surplus divided pro rata among the holders of the voting trust certificates representing the common and preferred stock, in accordance with the respective rights of these issues. No dividends are to be paid on the stock until after the payment of the debts represented by the promissory notes or bonds.

The plan now presented contemplates the operation of the fabricating portion of the plant only. This is the part of the plant which has been operated by the receivers and which represents that department of the business so long and successfully conducted by the old firm of Milliken Brothers. Further development and operation of the steel plant will be deferred until a future date.

It is believed that if there be a prompt acceptance of this plan by the creditors its success will be assured and an adjudication in bankruptcy avoided. If it is not promptly accepted by the creditors, an adjudication in bankruptcy, a motion for which is now pending, will be had, and the excellent organization which the receivers have maintained will be disintegrated, the good will and trade name will be lost, and the business sold out under the hammer.

The Staten Island plants are valued in the statement of assets at \$6,232,134, and the total assets are put at \$7,659,394, after the deduction of \$68,665, representing accounts payable, reserve for replacement, &c.

The American Institute of Chemical Engineers' Meeting.

A new national society, the American Institute of Chemical Engineers, held its first semiannual meeting in Brooklyn, N. Y., June 24, 25 and 26. The first day was occupied with the presentation of papers and discussions and the remaining two days with excursions to the Atlantic White Lead Works in Brooklyn, the Corn Products Refining Company and the Warner Sugar Refining Company in Edgewater, N. J., the Standard Oil Company's works in Bayonne, N. J., and the Consolidated Gas Company's works in Astoria, L. I.

The following covers briefly the papers presented at the professional session held in the Brooklyn Polytechnic Institute: Prof. W. D. Ennis, in a paper on "The Limits of Efficiency of the Power Gas Producer," dealt with the chemical reactions and the thermal results in a typical suction producer and showed that its efficiency may be raised by reducing the sensible heat in the gas delivered. O. K. Zwingenberger followed with a paper on "The Utilization of Low Grade Fuels in the United States." He showed the possibilities of the immense deposits of peat and lignites in this country if utilized with the application of the Zeigler process, which he is attempting to introduce in the United States, and referred to the results which are being obtained in Sweden and Germany. The president of the institute, S. P. Sadtler, spoke on "Creosote Oil from Water Gas Tar," and contradicted the common belief that it is inferior to the creosote obtained from coal gas tar. He has found it to be especially suitable for preserving wood. "An Automatic Acid Egg," a paper by R. K. Meade, described a cast iron egg for automatically measuring and discharging acids. Dr. C. F. McKenna discussed an economic problem, "The Centering of Great Industries in the Metropolitan District," analyzing the situation in New York City and its vicinity. Of most interest to metallurgists was Prof. J. C. Olsen's paper, "Experiments in the Case Hardening of Steel with Gases." J. G. Dean offered the last paper, "Methods of Clay Control," describing the methods of testing, equipment and practice in the Portland cement works, with which he is connected.

Cyclone Special Steel Tests.

Lionel & Montagu Samuel, 25 Cliff street, New York, general agents for Cammell Laird & Co., Ltd., Sheffield, England, furnish some interesting data of recent tests of their Cyclone Special steel.

A steel manufacturer made a test in turning a chilled cast iron roll. The diameter of the roll was 12 in., and the turning was done with a forged and hardened shovel nose tool, 1 1/4 x 5/8 in. The operation was cutting, or what may be termed making a roughing cut. The roll was a finished roll and much harder than the rolls ordinarily used by this manufacturer. It was harder to turn than a roll of rough surface, as it was more difficult to make the tool take hold on account of the glazed surface. The speed per minute was 18 in., with 1-64 reduction per revolution, making the chip 0.128 in. at this speed. After running for several revolutions the speed was increased to 3 ft. per minute and the feed to 1-64, making a reduction of 1-32 per revolution. After running 3 min. at this speed it was increased to 7 1/2 ft. per minute, with a 1-64 chip, reducing the roll 5-32. The feed was then forced beyond the limit of endurance for the tool, but those who were making the test were well satisfied that the steel was the best they had ever used.

Another test was made by a large automobile manufacturer against two other brands of high speed steel of good reputation. These two steels were unable to turn more than four pieces of heat treated stock. On the first test of Cyclone Special steel six pieces were turned, when the method of treating was changed and 20 pieces were turned, the tool still being in condition to continue. The operator then succeeded in turning one and one-half gear blanks before the tool went down.

The third test was in a machine shop and was as follows: On a piece of 0.50 carbon steel 1 1/4 in. square,

turning to $1\frac{1}{2}$ in. round, the lathe was run at 550 rev. per min. and a feed of $2\frac{1}{2}$ in. per minute, then to $5\frac{1}{4}$ in., then to $6\frac{1}{8}$ in., until the superintendent insisted on the work being stopped, as the steel was not being given a proper trial and he did not desire to break the lathe.

Rolling Mill Discussions by Electrical Engineers.*

D. B. Rushmore, Schenectady, said that in rolling mill practice there are as wide fluctuations in load and through as great magnitude as in any other classes of industrial service. We have the very exacting condition of a prime mover working at best efficiency through a narrow range of output and perhaps not the best regulation. Continuous operation is necessary also. Turbines floating on the line may be used as over-excited synchronous motors to load down the prime movers to the point of constant output. The solution at Gary was the most desirable one. In answer to a question by Edward Van Wagenen, New York, Mr. Woodbridge said, in closing, that the voltage regulation at Gary is excellent.

D. B. Rushmore, Schenectady, said that the object of these papers was to bring out a discussion upon the most interesting phase of present industrial power work. He urged the steel mill men present to bring out at Institute meetings the engineering features in which they are interested. Steel mill operating engineers and the manufacturing engineers should co-operate. Reliability is the greatest requirement of a steel mill work. Too much stress upon price always means a certain sacrifice of engineering features. In steel work the value of the output is great in comparison with the value of the machinery. The engineer of the steel mills is the man to buy the apparatus, rather than the purchasing agent. The development of the control is one of the most important phases of the subject. We are entering an era when practically all the steel mills will have to be electrified in order to meet competition. C. F. Scott, Pittsburgh, indorsed Mr. Rushmore's remarks. In no field has electrical development been as rapid as in the steel mills. The electric furnace is coming into steel making more and more; the electrical engineer is occupying a controlling position instead of one that is auxiliary.

R. Tschentscher of the Illinois Steel Company, South Chicago, presented a typewritten discussion of electric power problems in steel mills. He classified the mills, and cited the South Chicago plant as an example of a self-contained installation supplying power to other industries. The evolution of the plant is illustrated by a capacity 10 years ago of 160 kw., compared with a present capacity of 26,000 kw. To-day's installation includes 2000 motors, having a total rating of 75,000 hp., a 1200-kw. storage battery outfit, 7000 kw. in converting apparatus, and 33,000 kw. in transformers. He then discussed the enormous waste of heat in a steel mill. One of the services of this plant is to supply power to 7000 kw. of induction motors, driving a cement mill 11 miles away. The power factor was 70 per cent., but two 1650-kw. synchronous condensers are being installed at the end of the line to improve conditions, the guaranteed saving being \$10,000 a year in the net cost power at the delivery point. A 15 ton, three phase electric furnace has been in operation in South Chicago for two months, supplied with power from three 750 kw., 25 cycle, 2200 volt to 100 volt transformers. The amount of power required for electric steel furnace service of 4000 tons per day capacity would be about 25,000 kw. The speaker believes that electric steel making will soon be in general use. A typical self-contained plant having a capacity of 2,000,000 tons per year, including cement manufacture also, would require 100,000 kw. in machinery, using no coal and depending upon blast furnace and coke oven gases. The steel mill engineer must be about 60 per cent. business man and 40 per cent. engineer. He still has the sentiment of the rolling mill superintendent to contend with, and if any man on earth must be "shown," he is the one.

K. A. Pauly, Schenectady, emphasized the value of nonautomatic control for rail mill motors over a limited range, say of from 10 to 15 per cent. Referring to Mr. Specht's paper, he said that in determining the capacity of a flywheel, the cost of power, the generating station and the rolling mill motor enter. The economical size of flywheel is greater where the power cost is high or where the over-load capacity is small. As the number of mills driven from a single station increases, the station peaks decrease, and the extent of flywheel capacity necessary tends to go down. J. C. Parker, Rochester, N. Y., emphasized the importance of Mr. Specht's paper in central station work. Flywheel apparatus had wide importance in smaller service where motors are applied. The effect on the central station is of less importance than the quality of service rendered at the machine. He questioned the advisability of the independently driven flywheel.

C. F. Scott, Pittsburgh, reviewed the early history of steel mill motor designs, pointing out the importance of an extremely reliable machine for this service. Continuity of service is of enormous importance. The particular conditions of power supply and the fluctuating load call for the broadest kind of engineering. The cost of power is not the vital point. Mr. Tschentscher saved \$1.50 per year per motor horsepower, but in this case the power factor increased the cost of the power only from 5 to 10 per cent. Savings in labor and increase of output would overbalance the saving in power. Effective operation was the important point. Discussing Mr. Friedlander's paper, Mr. Scott said that the electric drive and measurements enabled one to study the performance of the rolls quantitatively and to check the condition of equipment and study the conditions of mill work in a scientific way. The machine shop offers an analogous case. The reason for the electric drive is the increased output possible rather than the economy. Much will be gained by centralizing the power in a steel mill and applying electrical distribution.

Mr. Specht said that a separate flywheel was installed in a case described by him because the electrical design of the motor did not take such a device into account. He thanked Mr. Rushmore for getting the rolling mill and electrical men together. H. E. White, closing, said that in regard to the use of a dynamic brake in connection with a wound secondary of an induction motor, there is no present means of bringing such a machine to rest by alternating current without imparting a tendency to start it in the opposite direction. A. M. Dudley pointed out that there is no advantage in weight in using a separate flywheel, but that the motor can be built somewhat lighter. It is not difficult to stop a direct current motor by putting direct current into it.

C. T. Henderson, in closing, said that a peculiarity of English instruments is that the scales read from right to left. The automatic slip regulators at Gary have been criticised as being too slow, but if it had been desirable, their action could have been quickened by the use of current relays operating directly on the contractor windings. He could not agree with Mr. White that direct current contractors are slower than alternating current contractors. If it were so, it could easily be corrected by a permanent resistance in the contractor winding. Neither did he agree with Mr. Yearsley that the controlling apparatus is not as reliable as the other equipment. It is necessary to have adequate apparatus to limit the motor current in rolling mill practice, since the mill cannot stand the time required for a circuit breaker to go out and be reset. At this point Mr. White interjected a good word for the alternating current contractor. W. L. Abbott, Chicago, outlined a method of calculating flywheel sizes by averaging a power wave diagram. J. C. Parker, Rochester, said there is a blast furnace plant on the Niagara frontier taking 16,000 hp. from an outside source. The interests of the central station and the steel mill may not be far apart. The Solvay people have utilized some of their by-product power for industrial service.

The McKenna Company has been formed at Cleveland, Ohio, with offices in the Williamson Building, to handle contractors' machinery.

* Discussion at the 26th annual convention of the American Institute of Electrical Engineers, Frontenac, N. Y., June 30, 1909. We are indebted to the *Electrical World* for this report.

Electric Driven Rolling Mills.*

BY E. FRIEDLANDER.

The first electric-driven steel rolling mill in the United States was installed about four years ago by the Carnegie Steel Company at its Edgar Thomson Works. Since then a number of other electric mill drives have been installed and run with entire success, a noteworthy example being found at the steel plant at Gary, Ind. The introduction of the electric drive has made it possible to clear up many points in regard to the power required for rolling different shapes of steel, and, moreover, the roller or operator is able to see at a glance the work done by each pass. The electric roll drive has also taught us how to get the best relation among rotating masses, speed, time and horse power. It has helped the roll designer to calibrate rolls in such a manner that the power characteristic for all the passes is uniform, thereby avoiding high power peaks, decreasing the size of the prime mover, and reducing first cost and fuel consumption.

Information from the Watt Meter.

The watt-hour meter warns the roller of bearings or rolls becoming tight and hot, or that steel is causing excessive friction in the passes, often due to overfilling, cold steel or faulty calibration, thereby guarding against damage to the rolls and bearings. The meter indicates that lower heat, greater elongation and especially change of profile in different directions increase the power required at the rolls much more rapidly than do chemical hardness, high tensile strength, or larger drafts. The meter also shows that it is not the higher percentage of carbon in steel which requires more power in rolling, but the lower temperatures at which this steel has to be rolled, and also that an increase in width of the steel shape requires more power than a decrease in height. By means of the meter, too, it can readily be seen that rolling "squares" and "rounds" takes per square inch displacement much less lower than shapes with large peripheries and many flanges, as the latter cool off quickly and cause much friction in the rolls.

Tests on rail mills have shown that the foot-pounds per square inch of displacement gradually increase the nearer the rail is to the finishing pass. A 75-lb. rail required 1100 ft.-lb. at the first pass on the first "rougher." On the same stand in the seventh pass it required 3000 ft.-lb., in the first pass on the second roughing rolls 4800 ft.-lb., in the fifth pass 8150 ft.-lb.; 9500 ft.-lb. were required for the last or finishing pass. The large increase in foot-pounds is partly due to the greater density and rapid cooling of the steel, especially at the thinner flanges near the finishing pass. For this reason the flanges are rolled out as late as possible. Whenever required, exact power consumption can be given for each phase of rolling.

Electric Motor and Steam Engine.

The ideal motive power for rolls should drive them slowly when the steel enters and should drive the roll faster as the piece lengthens. The reciprocating engine will do just the reverse; namely, run very fast without load and slow down as the load increases, finally stopping if the load becomes too great.

The maximum torque of reciprocating engines is fixed by the size of the cylinders and the pressure; it cannot be increased, no matter how much steam or gas is available. For this reason most mill engines are made very large and often run with only half load, causing high steam consumption per horsepower, their most economical cut-off being at full load.

For this work the characteristics of the electric motor are much better. Even with double its full torque the efficiency is good and the motor will not stop, but will take more and more current, finally becoming overheated and burning unless properly protected. If desirable, its speed changes from no load to full load can be made small. The current can also be limited to a

certain maximum, without stopping the motor, in this manner preventing excessive strains and probably serious breakdowns.

Where high speeds are necessary motors can be direct connected to rolls, increasing the energy of the rotating parts and at the same time decreasing the size of motor, the power required and the fuel consumption. Heavy reciprocating engines cannot run at such high speeds, and must be connected to the rolls by means of gears, ropes or belts.

To obtain accurate information as to the exact power requirements for rolling steel, indicator diagrams were taken on reciprocating engines doing similar work, but these in many instances were misleading. The work of rolling steel is very changeable and intermittent. Engines often run with light loads, but at short intervals have their valves wide open. This, together with the work done due to the energy of the rotating parts, should be carefully observed. Although it probably is not difficult to get the maximum torque required to decide on the normal capacity of the motor, the above mentioned points must be considered, together with the length and number of pieces in the rolls, and also time intervals between passes. To be on the safe side it is advisable to follow standard mill practice and make motors of ample size and strength, in order to stand the severe service and overloads without injury.

Functions of Flywheels.

In mentioning flywheels the writer had only three high nonreversible mills in mind. As the weight of rotating parts is much greater in large motors than in reciprocating engines, and the energy of the rotating parts increase as the square of the speed, it is obvious that even a small change in speed is of great importance. As tests have shown that rotating masses are sometimes not only of no use, but that they often prove a drag on the motor, careful study of this feature has to be made in each case.

While the steel is being rolled, both the motor and the flywheel furnish the power, but as soon as the steel leaves the rolls the motor should accelerate the rotating masses to the same speed before rolling. The time available and the number of revolutions will determine the size of the motor more than anything else.

It has been observed that on blooming and roughing mills, where the pieces are very short and the intervals long, rotating masses supply the largest part of energy during the rolling period and should therefore be large. The reverse takes place at the finishing passes, where pieces are long and follow each other rapidly. Heavy rotating masses would in this case be useless, and would even require larger motors for their quick acceleration.

Where one motor drives roughing and finishing rolls, curves should be plotted showing the number of pieces in the rolls at the same time, the length of passes and intervals, the power required for each pass, &c. With the help of such curves, the best relation between the sizes and speed of the motor and flywheel, radius of gyration and slip of motor can be easily determined.

Fluctuation in Power.

The total motive power required in a steel plant is changeable and fluctuates continuously, the average in many plants being often below one-fourth of the total horsepower installed in motors. The electric driven rolling mills will, however, demand considerably larger power stations to take care of the large currents, especially when all the motors happen to be overloaded at one time, as for instance when rolling cold steel. It is very important to find out beforehand how much of this fluctuating load the power house may have to supply, assuming the worst conditions, as the shutdown of the electric power station for even a very short time will stop the operation of a large number of machines and cause enormous losses. This is the one very objectionable feature of making such a great number of prime movers entirely dependent on one power station, and, therefore, some means should be taken to prevent this disturbance.

With steam engines and boilers the liability of a complete shutdown is not so great, but the delays and annoy-

* A paper read at the 26th annual convention of the American Institute of Electrical Engineers, Frontenac, N. Y., June 30, 1909.

ances caused by low steam pressure are of daily occurrence in many plants. In such cases not only will all the steam driven prime movers be unable to develop the required power, but also in trying to develop this power they will use more and more steam, thus making it difficult to raise the steam pressure without increasing the number of boilers, or decreasing for a while the load and consequently the production.

The short, high peaked current demands should be kept off the power station as much as possible and only the average current be supplied. The least number of units can then be kept running under nearly full load with the most economical fuel consumption and the least wear and tear of moving parts. As before mentioned, the average current consumption in a steel plant is always small in comparison with motor capacity, on account of the intermittent work and large amount of inertia of the rotating parts. By means of storage batteries or flywheel substations the occasional large demands for current can be taken off the station and supplied from these two sources, where it is stored up when the current demand is below the average.

The exchange of current from one motor to another, in connection with electric roll drives, is often considerable and should not be overlooked.

Electric Reversing Mill.

With regard to the electric reversing mill, it is a fact that soon after its first appearance the use of reversing rolls became more general, especially in England and Germany. In those countries small quantities of one kind and shape of material are rolled, and the cost of the large number of rolls required and the saving of time in changing rolls are probably the chief reasons for using the reversing mill, where many different sections can be worked with the similar rolls. The absence of the heavy and troublesome lifting tables is also a welcome feature, especially when pieces rolled are very long.

The first installation in this country of an electric reversing mill, at the Illinois Steel Company's Works at South Chicago, has given entire satisfaction from the start, and has demonstrated that the electric motor is much better adapted for this kind of work than the reciprocating engine. Although the first cost was high, its lower depreciation, better operation and lower cost of maintenance should justify its installation.

In a reversing mill the operator is able to draw steel slowly into the rolls and "speed up" while the piece lengthens, making a great advantage in rolling steel. In order to obtain perfect speed regulation no use can be made of steam expansion, but admission continues during nearly full stroke. Even then much depends on the skill of the operator, who can subject the engine and the mill to very severe shocks and cause serious breakdowns if he is not careful. Reversing mills are therefore made heavy and strong.

If too much steam is admitted it is difficult to prevent such large engines from racing without load. It is also wasteful, as both the time of actual rolling and the speed of the rolls are limited, most of the power being consumed in the rapid starting and stopping of the heavy rotating parts, without making any use of their flywheel energy.

With the use of electric motors in place of reciprocating engines, the problem of reversing rolls becomes much simpler and better, in regard to manipulation, fuel consumption and cost of maintenance. Operation of electric driven reversing mills is nearly automatic; no skilled operator is required and all danger to the motor and the mill is eliminated. The speed of acceleration is prearranged, and no matter how fast the operator moves his levers the maximum current and the speed are limited.

Reversing is done with the least shocks in rolls and couplings and the danger of overstraining machinery is done away with. It is important to be able to reverse the motor just as rapidly as the engine. Special care should therefore be taken to have a motor generator that will give large currents with very low excitation and one that will be quickly magnetized and demagnetized.

It has been observed that only one-fourth of the power required at the reversing roll motor is the average sup-

plied from the power station. The large current demands are furnished by the motor generator through the energy of the high speed flywheel and a considerable amount of current is sometimes sent back into the line.

Direct Current Motors.

As for all other mill work where power and speed variation are considerable, the direct current motor, on account of its load and speed characteristics, is better adapted for driving rolls than the alternating current motor. For reversible roll drives it is used exclusively. There is no reason why the direct current motor should give any more trouble than the direct current generator at the power station. Four years' experience has shown that the wear of the commutator and the cost of maintenance amount to practically nothing. The transmission of large low tension currents is much more serious, especially when tens of thousands of horsepower have to be supplied and the distance of the motors from the station is considerable.

The use of higher direct current voltages in connection with large rolling mill motors should be satisfactory; but no doubt high tension alternating current transmission and induction motors direct on the line will be generally employed, especially in new installations. Where conditions demand it, the induction motor characteristics can now be made nearly similar to the compound wound, direct current motor. However, much of its simplicity and efficiency will be sacrificed in doing this.

Among some of the earlier disadvantages of the induction motor were: very large current required for starting under heavy load; one speed fixed by the number of poles and the tendency always to run at synchronous speed; low power factor with light loads; small air gaps; impracticability of reversing large units, and inability to change speed to flywheel requirements.

In the design of the modern rolling mill motor most of these objectionable points have been remedied by different means, such as wound motors, the introduction of variable resistance, changing the number of poles, shifting the phases, slip rings, &c.

Whether direct current power stations and direct current motors are used, or alternating current stations are installed for high tension transmission with alternating current motors directly on the line or fed through transformers, or direct current motors are supplied from an alternating current station through converters or motor generators, batteries or flywheel substations, is a matter of detail. No doubt any one of these systems will give satisfaction if properly designed and installed.

An Important Pennsylvania Railroad Improvement.

The Pennsylvania Railroad Company and the Northern Central Railway Company have just awarded a contract calling for the construction of a new classification yard at Northumberland, Pa., about two miles west of Sunbury. Its completion is expected to greatly facilitate the movement of traffic through Sunbury, where four divisions of the Pennsylvania lines now converge. The shifting and classifying of cars at Sunbury have to be done on tracks which are crossed at grade by a number of important streets. These facilities are inadequate, and their extension or enlargement is impracticable. The maximum movement at Sunbury has been as high as 4000 cars per day, and the daily average in 1907 was 2790 cars per day.

The new contract calls for a yard about three miles long and to cover an area of about 700 acres. The construction work involves about 3,000,000 cu. yd. of grading, 18,000 cu. yd. of bridge and culvert masonry, 70 miles of new track, a change in location of a public road $1\frac{1}{2}$ miles long, a 36-stall roundhouse, power house, machine shop, transfer shed and some smaller buildings. The plans provide for east and west bound "hump" classification yards, and the water system, lighting and other facilities will represent the best modern practice in construction of this character.

May Iron and Steel Exports and Imports.

The monthly report of the Bureau of Statistics of the Department of Commerce and Labor shows little change in our foreign trade in iron and steel in May as compared with April. The values of exports slightly decreased, while the values of imports made a trifling increase. The value of the total exports of iron and steel and manufactures thereof, not including ore, in May was \$12,993,197, against \$13,058,054 in April. The total value of the same class of imports in May was \$2,244,600, against \$2,154,430 in April.

The exports of commodities for which quantities are given show some increase in the quantity exported in May, as the total was 109,977 gross tons, against 100,904 tons in April, 94,523 tons in March, 84,860 tons in February and 70,085 tons in January. It will be seen from these figures that our exports of heavy products have been increasing steadily from month to month since the opening of this year. The details of the exports of these commodities for May and for the 11 months of the fiscal year ending with May are as follows:

	Exports of Iron and Steel.		Eleven months.	
	May.		1909.	
	1909.	1908.	1909.	1908.
	Gross tons.	Gross tons.	Gross tons.	Gross tons.
Pig iron.....	5,121	3,621	42,332	47,612
Scrap	3,819	1,840	21,193	18,527
Bar iron.....	1,297	634	10,536	12,443
Wire rods.....	1,427	401	11,196	6,072
Steel bars.....	4,763	2,818	45,461	60,106
Billets, blooms, &c....	13,981	3,831	98,757	87,310
Hoop, band, &c.....	269	170	3,213	8,285
Steel rails.....	30,794	11,440	213,315	263,108
Iron sheets and plates.	5,403	3,208	51,027	38,900
Steel sheets and plates.	8,479	5,320	70,760	56,626
Tin andterne plates..	641	2,220	4,465	14,897
Structural iron and steel	5,809	5,091	92,820	125,882
Barb wire*.....	4,645	12,077	{ 60,163 }	146,545
Wire	8,719		{ 63,664 }	
Cut nails.....	848	588	7,034	5,953
Wire nails.....	1,581	1,665	24,350	34,307
All other nails, including tacks.....	593	238	6,088	5,283
Pipes and fittings.....	11,788	8,880	118,312	159,634
Totals.....	109,977	64,042	944,686	1,091,490

* Not separately stated prior to July 1, 1908.

The increase in the May exports was mainly due to the larger shipments abroad of steel rails. The exports for the month to South America aggregated 12,993 tons, to Mexico 9473 tons, to British North American 4696 tons, to Asia 2021 tons, to the West Indies 1104 tons, and small quantities to Europe, Central America and Africa.

The imports of commodities for which quantities are given reached to total of 18,352 gross tons in May, against 17,772 tons in April, 20,714 tons in March, 19,418 tons in February and 19,782 tons in January. The details of the imports of these commodities for May and for the 11 months of the fiscal year ending with May are as follows:

	Imports of Iron and Steel.		Eleven months.	
	May.		1909.	
	1909.	1908.	1909.	1908.
	Gross tons.	Gross tons.	Gross tons.	Gross tons.
Pig iron.....	8,747	4,975	94,032	194,751
Scrap	642	...	5,132	17,077
Bar iron.....	501	300	14,051	31,645
Rails	6	7	1,292	2,633
Hoop, band, &c.....	45	9	1,035	472
Billets, bars and steel in forms n.e.s.....	1,008	818	11,524	15,401
Sheets and plates....	160	152	2,978	2,381
Tin andterne plates..	6,488	6,642	46,725	55,180
Wire rods.....	692	630	10,520	12,461
Structural iron and steel	63	51	5,384	1,470
Totals.....	18,352	13,584	192,673	333,471

The imports of iron ore in May were 97,393 gross tons, against 74,782 tons in April, 108,676 tons in March and 61,749 tons in February. The total imports of iron ore for the 11 months of the fiscal year ending with May were 890,933 tons, against 914,949 tons in the corresponding period of the previous fiscal year.

The total value of the exports of iron and steel and manufactures thereof, not including ore, in the 11 months of the fiscal year ending with May was \$131,200,451, against \$172,304,238 in the corresponding period of the

previous fiscal year. The imports were, respectively, \$19,978,377 and \$25,848,258.

PERSONAL

Horace Hammond of the Hammond-Byrd Company, Birmingham, Ala., is expected to return from points along the Pacific Coast about September 1.

T. G. Bush, Jr., general manager of the Coosa Pipe & Foundry Company, will spend the remainder of the summer in the West to recuperate from a recent serious illness.

J. B. Becker has established himself as machinery manufacturers' agent in the Sheldon Building, San Francisco. He was formerly with Baker & Hamilton.

G. B. McLean recently resigned from C. C. Moore & Co. to accept a position as salesman for the Allis-Chalmers Company in Pacific Coast territory.

A. W. Sprague has resigned as manager of the fence department of the American Steel & Wire Company, Chicago, and has accepted the presidency of the De Kalb Fence Company. John W. Meaker has been appointed manager of the company's fence department, with H. A. Parks as assistant manager.

D. E. Manson, New England manager, with headquarters at Boston, for the Westinghouse Electric & Mfg. Company for the past 10 years, has resigned his position to accept the office of vice-president with a number of New England gas and electric companies owned and operated by the Tenney Syndicate.

Peter J. McEntee, for many years superintendent of the Solid Steel Casting Company's plant in Chester, Pa., has taken a similar position with the Maryland Steel Company, Sparrows Point, Md.

A. C. Barler, president of the A. C. Barler Mfg. Company, maker of oil stoves, 104 Lake street, Chicago, has won a reputation for himself in an unusual way in these days of tax evasions. The Chicago daily papers are giving considerable space to relating the fact that Mr. Barler recently notified the local Board of Review that his company's assessment for taxes was too low; he also called attention to the total omission of an assessment on his household goods. Instances of this kind are so rare that the Chicago papers cannot resist the temptation to say that Diogenes died too soon, as he would have discovered in Mr. Barler the honest man for whom he is said to have unsuccessfully hunted.

Joseph W. Marsh, formerly vice-president and general manager of the Standard Underground Cable Company, has been elected president of the company, succeeding the late Mark W. Watson. He will continue his duties as general manager. Mr. Marsh was also recently elected president of the Exchange National Bank of Pittsburgh.

F. B. Richards of M. A. Hanna & Co., Cleveland, sails for Europe this week.

Dr. Charles B. Dudley, Altoona, Pa., sailed from New York July 7 on the Pennsylvania.

Brazilian Ore Deposits Extraordinary.—It is not often that a sensational article is found in the *Daily Consular and Trade Reports*, issued by the Department of Commerce and Labor. In the issue for July 2 a most remarkable statement is printed which comes from Consul General George E. Anderson of Rio de Janeiro, regarding the iron and manganese ore deposits of Brazil, in which he quotes from a report just made by the Brazilian government regarding the Minas Geraes deposits. The report says: "On the basis of the surveys made, the 52 deposits contain a little less than 6,000,000,000 tons of the highest grade ore. In addition loose high grade ore was located to an amount as large as that found in the outcrops, the total high grade ore located thus amounting to 12,000,000,000 tons." The examination disclosed ore running "from 60 to 75 per cent. pure iron, free from all impurities which might interfere with its proper smelting." Evidently the "boomer" is not confined to North America, but has his buoyant and extravagant counterpart in the countries south of the equator.

The American Car & Foundry Company.

The tenth annual report of the American Car & Foundry Company presents the following statement of net earnings for the fiscal year ending April 30, 1909:

Earnings from all sources (before deductions as noted hereunder).....	\$3,741,974.79
Less renewals, replacements, repairs, &c. In addition to this amount there was also expended for extraordinary improvements and charged to the reserve for general overhauling, improvements and maintenance the sum of \$483,418.51).....	846,144.11
Net earnings.....	\$2,895,830.68
Less dividends:	
On preferred capital stock, 7 per cent. \$2,100,000	
On common capital stock, 2 per cent. 600,000	
	2,700,000.00
Surplus earnings for the year.....	\$195,830.68
Surplus, April 30, 1908.....	22,367,247.35
Surplus, April 30, 1909.....	\$22,563,078.03
Following is the statement of working capital:	
Working capital, April 30, 1908.....	\$17,184,714.84
Add surplus earnings for year ending April 30, '09	195,830.68
Net working capital, excluding reserves, April 30, 1909.....	\$17,380,545.52

The general balance sheet as of April 30, 1909, is as follows:

<i>Assets.</i>	
Property and plant account.....	\$65,182,532.51
Cost to April 30, 1908.....	\$63,682,532.51
Add for additional real estate purchased during year.....	361,845.15
Reservation for construction of and additions to steel car plants.	1,138,154.85
Current assets.....	25,731,906.77
Materials on hand, inventoried at cost or less, and not in excess of present market prices.....	\$5,610,016.80
Accounts and notes receivable...	8,744,004.92
Stocks and bonds of other companies, at cost, or less.....	738,507.38
Bank certificates of deposit.....	5,700,000.00
Cash in banks and on hand.....	4,939,377.67
Total.....	\$90,914,439.28
<i>Liabilities.</i>	
Preferred capital stock.....	\$30,000,000.00
Common capital stock.....	30,000,000.00
Current liabilities.....	3,046,624.91
Audited vouchers for material and notes payable, not due; pay rolls (paid May 10, 1909).	\$3,271,624.91
Dividend No. 41 on preferred capital stock (payable July 1, 1909).....	525,000.00
Dividend No. 27 on common capital stock (payable July 1, 1909).....	150,000.00
Reserve accounts.....	4,404,736.34
For insurance.....	\$1,000,000.00
For purchase price of Wilmington plant.....	500,000.00
For general overhauling, improvements and maintenance.....	1,166,581.49
For construction of and additions to steel car plants.....	1,138,154.85
For dividends on common capital stock, to be paid when and as declared by Board of Directors	600,000.00
Surplus account.....	22,563,078.03
Total.....	\$90,914,439.28

From President Frederick H. Eaton's report to the stockholders the following extracts are taken:

The business depression referred to in the president's letter to the stockholders of June 25, 1908, has continued throughout the year covered by the present report; this depression being marked, so far as railroads are concerned, by a disinclination to order new equipment. Notwithstanding this, the company, even though working on a small margin of profit on the total volume of its business, has been able to make net earnings sufficient to pay dividends at the rate of 7 per cent. upon its preferred and of 2 per cent. upon its common stock; to charge out in excess of \$800,000 of its earnings for renewals, replacements, &c., and to leave in addition a surplus of \$195,830.68, which has been added to working capital. This result has been largely due to two causes: First, our facilities for the production of miscellaneous mate-

rials and supplies, and second, the possession of a working capital sufficient to enable us to take advantage of favorable market conditions.

The experience of the last few years has demonstrated the practicability and economy of steel passenger car construction, both for sleeping cars as well as for ordinary coaches. The use of this class of cars has greatly increased during the past few years and bids fair to increase still more in the future. The management has given particular attention to this phase of car construction, working along the lines of perfecting the system of shop practice, economy of construction and efficiency of production. The company has to-day in operation four plants for the production of cars of this type, namely, at Berwick, Pa., at Wilmington, Del., at Jeffersonville, Ind., and at St. Charles, Mo. Of these plants that at St. Charles will have its new building completed during the summer; that at Jeffersonville has been equipped with additional machinery; that at Wilmington is being improved by the erection of a new building, which will greatly increase its capacity and will insure still greater economy of operation; and the capacity of the Berwick plant is being largely increased by the addition of an extension to the finishing department. In this work of new construction and equipment the management has adhered to the policy of fireproof construction and the use of the best and most modern equipment, involving somewhat larger initial outlay but giving in the end the best and most economical results.

While there has been the increase noted in steel passenger car construction, nevertheless there still exists a very considerable foreign and domestic demand for the all wood and steel underframe type of passenger equipment. The company is in condition to respond at once to all demands for all classes of passenger equipment, whether of all steel, of all wood or of steel underframe construction.

The various freight car plants have been maintained in a state of high efficiency. Practically all of these plants are fully equipped for the production of any class of freight cars required, whether all steel or otherwise. We are to-day in all respects prepared to meet a demand for our products greater than we have had at any time in the history of the company; and, with a view to improvement in railroad and business conditions generally, we have perfected plans for the prompt and timely construction of another steel car plant.

The management deems it advisable hereafter to omit the résumé of the company's business which it has heretofore been its practice to present quarterly. This decision has been reached after very careful consideration and is based upon the conclusion that a quarterly statement does not always fairly reflect the condition of the company's affairs in their entirety. In the conduct of so diversified a business as is done by this company a quarterly statement sometimes gives an apparent and undue advantage to one quarter over another. The management has hesitated to make any departure from its prior practice, but feel that this decision on this subject is fully justified and that it will be a better and more satisfactory plan to have our reports based upon the result of the operations of our entire fiscal year.

The number of car orders on hand at the close of the year, April 30, 1909, was substantially the same as on the corresponding date of the prior year—with the difference, however, that there is every prospect of an increase of business during the coming year, which condition did not exist at the close of our fiscal year 1907-8.

The Standard Engineering Company, Ellwood City, Pa., received a contract for the erection of a 22-in. bar mill at the Clairton Works of the Carnegie Steel Company, and also an order for a new drive for the axle mill of the Indiana Steel Company at Gary, Ind.

A. Marx, dealer in old metals and second hand machinery, New Orleans, La., admitted into his business July 1 his three sons, Edward, Simon and Isaac, and the business will now be carried on under the firm name of A. Marx & Sons.

The Tariff Bill's Progress Through the Senate.

WASHINGTON, D. C., July 6, 1909.—The Senate to-day completed the consideration of the tariff bill in Committee of the Whole and formally reported it to the full Senate, by which it will be taken up to-morrow. Chairman Aldrich of the Finance Committee to-night expressed the opinion that the bill would not remain in the Senate more than two days, and, therefore, would be sent to the House on or before Friday of this week. Less optimistic Senators are confident that the bill will reach the House by Saturday, and it is expected that arrangements will be made by that body to consider it next Monday, and to refer it to the Conference Committee on that date.

May Be Law by July 24.

So much progress has already been made in adjusting the differences between the Ways and Means and Finance committees that it is believed that 10 days will suffice to harmonize all the disagreeable provisions of the House and Senate bills, and allowing a reasonable length of time for the consideration of conference reports in both houses there is no reason why the bill should not be finally passed and the special session adjourned on or before the 24th inst.

The dutiable schedules and free list of the pending bill were completed several days ago, and attention has since been given to the internal revenue and administrative features of the measure. Probably the most important of these is the provision taxing the incomes of corporations in excess of \$5000 per annum at the rate of 2 per cent., which has been incorporated in the bill with the general understanding that it will remain in force not to exceed two years, as it will produce an annual revenue estimated at not less than \$50,000,000. Its chief function will be to recoup the treasury for the heavy drain of the deficits for the past two fiscal years. In the meantime the full capacity of the new tariff law as a revenue producing measure will be developed, and there can be no doubt that the receipts will be adequate to meet all expenditures, allowing for a normal annual increase.

Maximum and Minimum Provision.

The so-called maximum and minimum section of the Senate bill, which is designed to secure for American products the most-favored-nation treatment at the hands of the leading commercial countries of the world, has been modified in two important particulars: the countervailing duties on tea and coffee have been stricken out, so that the measure as finally agreed to imposes no retaliatory rates upon any item of the free list, and the proviso has been inserted allowing 90 days after the passage of the act before the President by proclamation shall apply the maximum rates to the products of those countries which in the meantime have failed to extend to imports from the United States the benefit of their minimum tariffs. The maximum and minimum provision as passed authorizes the President, whenever in his opinion the commerce of the United States has been discriminated against, to add 25 per cent. ad valorem to the rates on all articles of the dutiable list imported from the country so discriminating. The President is made sole judge as to whether any particular act amounts to a discrimination and there is no appeal from his decision.

Income Tax Resolution.

On the eve of reporting the tariff bill from Committee of the Whole the Senate passed a joint resolution submitting to the States an amendment to the Constitution authorizing Congress to levy a general income tax. The object of this measure is to make it practicable, in the event of an emergency, for Congress to pass an income tax, either graduated or based on a flat rate. While some of the ablest lawyers in the Senate assert that the decision of the United States Supreme Court in the case of the income tax provision of the Wilson act does not preclude Congress from enacting an income tax law that would not be repugnant to the Constitution, it has been regarded as the part of wisdom to remove all question by the adoption of a constitutional amendment. It is the general opinion that the joint resolution will

pass the House before the tariff bill becomes a law and that the legislatures of the States will ratify the amendment during the coming year.

W. L. C.

Customs Decisions.

Scrap Iron from Panama.

The Delaware Transportation Company has failed to secure free entry of scrap iron from the Panama Canal Zone because of lack of compliance with the requirements of the Treasury Department. When the merchandise reached the port of entry, which in this case was Wilmington, Del., the collector of customs levied duty at the rate of \$4 per ton, which is the rate for scrap iron. According to the importer the merchandise is entitled to free entry as "American goods returned." Although a bond was given under the Treasury regulations for the production of a certificate of exportation from this country, which is necessary if free entry is to be granted the returned merchandise, the bond was ultimately canceled by the Secretary of the Treasury by request of the importer. Consequently no such certificate was produced nor was any attempt made to produce it. In overruling the protest, Judge Somerville, for the Board of General Appraisers, says:

The identity of such articles manifestly, therefore, is not established in accordance with the regulations of the Secretary, which have been held to be a condition precedent to free entry under said paragraph. The importers have filed a number of affidavits of various parties who expressed the opinion that the goods in question are largely, if not entirely, of American origin.

The decision characterizes the affidavits as "very weak evidence."

Flies for Fishing, &c.

It has been decided by the Board of United States General Appraisers that so-called trout flies, bass flies, &c., are to be allowed to enter this country at the rate of 45 per cent. under the provision in the tariff for "manufactures in part metal." This action has the effect of sustaining a protest filed by Wakom & McLaughlin, the importers. The customs authorities classified the articles as "manufactured feathers," with duty at 50 per cent. After discussing the appropriate paragraphs under which the articles might be dutiable, General Appraiser Fischer, in his decision for the board, says that it is evident that metal is a substantial part of the manufactured articles, and are of greater value than the feathers. On this account the board is constrained to lower the duty 5 per cent., as requested.

The board, in a decision written by General Appraiser Fischer, has partially sustained protests filed by Abbey & Imbrie regarding the classification of fish hooks made from round iron or steel wire. Certain protests are sustained, while others are overruled.

The board has sustained protests filed by A. & H. Veith and Knauth, Nachod & Kuhne asking for lower duty on steel stampings and steel cylinders for holding gas.

Compasses or Dividers.

Cheap metal compasses or dividers with extra pieces of graphite, designed for use as drawing instruments for children, are not toys within the meaning of the tariff act, according to a decision of the Board of United States General Appraisers. Duty was assessed at 45 per cent., whereas B. Illfelder & Co., the importers, set up the contention that the classification should be as "toys," with a tax of 35 per cent. In his decision for the board, General Appraiser Fischer says that the instruments are not toys, nor have the importers shown that they are dealt in and known in the trade as toys. The board holds that the goods are susceptible of practical use and are readily distinguishable from the article it had previously decided to be toys.

Welding Compound.

A protest filed by the Goldschmidt Thermit Company, asking for lower duty on a material for welding, composed of titanium and iron oxide, was denied. The assessment of duty at 45 per cent. under the metal paragraph is affirmed.

Pig Iron Production.

Further Gain by Steel Works.

Output in the First Half of the Year About 11,000,000 Tons.

The steel companies' blast furnaces made a remarkable leap in production in June, their output being at the rate of 45,507 tons a day, or 5000 tons a day more than in May. The merchant furnaces for the fourth month in succession showed a reduced output, and are now making iron at about the rate of last fall before the national election. The steel companies added nine to the number of their active furnaces in June, while the merchant furnaces showed a net loss of four. The furnaces going in are of much larger average capacity than those going out, hence the figures for July 1 show a good increase in the weekly capacity active, the total being 463,729 tons, as against 446,096 tons a week on June 1.

Production in the First Half of 1909.

The June figures for coke and anthracite iron indicate that with an allowance for charcoal pig iron based on the output of the second half of last year, the pig iron production of the country in the first half of 1909 was about 11,000,000 gross tons. This compares as follows with the output of previous six months' periods as shown by the statistics of the American Iron and Steel Association, in gross tons:

	1906.	1907.	1908.	1909.
First half....	12,582,250	13,478,044	6,918,004	11,000,000
Second half....	12,724,941	12,303,317	9,018,014	.....
Totals ...	25,307,191	25,781,361	15,936,018	.....

The present rate of production, as indicated by the capacity active July 1, is over 24,000,000 tons a year, as against 25,781,361 tons in the record year 1907.

Daily Rate of Production.

The daily rate of production of coke and anthracite pig iron by months, beginning with June, 1908, is as follows:

Daily Rate of Pig Iron Production by Months.—Gross Tons.			
	Steel works.	Merchant.	Total.
June, 1908.....	23,923	12,521	36,444
July	25,762	13,525	39,287
August	28,952	14,899	43,851
September	31,117	16,183	47,300
October	32,217	18,337	50,554
November	32,705	19,890	52,595
December	35,172	20,986	56,158
January, 1909.....	35,983	21,992	57,975
February	38,367	22,609	60,976
March	36,811	22,421	59,232
April	36,436	21,526	57,962
May	40,531	20,222	60,753
June	45,507	18,822	64,329

June Product by Districts.

The table below gives the production of coke and anthracite furnaces in June and the four months preceding:

Monthly Pig Iron Production.—Gross Tons.					
	February. (28 days)	March. (31 days)	April. (30 days)	May. (31 days)	June. (30 days)
New York....	110,392	117,219	91,283	112,669	123,792
New Jersey....	19,518	19,577	19,798	19,836	18,590
Lehigh Valley....	50,762	49,072	46,463	58,176	52,464
Schuylkill Val....	51,447	58,169	54,004	52,755	46,004
Lower Susquehanna and Lebanon Val....	49,379	45,150	45,973	52,687	52,361
Pittsburgh Dis....	388,031	407,148	403,981	446,656	479,362
Shenango Val....	84,609	85,321	77,434	103,783	110,004
West. Penn....	116,711	139,873	129,543	128,413	112,975
Md., Va. and Kentucky....	52,257	56,402	63,311	60,143	54,448
Wheeling Dis....	53,735	58,156	46,696	63,980	94,664
Mahoning Val....	141,405	160,357	171,107	171,811	175,949
Central and North. Ohio....	124,650	126,719	119,226	125,554	135,319
Hocking Valley, Hanging Rock and S. W. Ohio....	42,772	48,521	43,841	38,995	32,908
Mich., Minn., Mo., Wis., Colo....	60,512	72,481	55,995	58,045	59,187
Chicago Dis....	196,061	219,009	211,776	250,363	263,126
Alabama....	135,374	143,407	136,909	119,823	101,280
Tennessee and Georgia and Texas....	29,725	29,613	21,537	19,641	17,451
Totals....	1,707,340	1,836,194	1,738,877	1,883,330	1,929,884

Production of Steel Companies.

Returns from all plants of the United States Steel Corporation, the Cambria, Pennsylvania, Maryland, Lackawanna, Wheeling, Republic, Youngstown Sheet & Tube,

Jones & Laughlin, La Belle, Bethlehem, Calumet, Inland, Colorado and Tennessee (Ensley) companies show the following totals of product month by month. We give separately a statement of the output of spiegeleisen and ferromanganese (as well as ferrosilicon), which is included for each month in the total production:

Production of Steel Companies.—Gross Tons.

	Pig.—Total production.—		Spiegeleisen and ferromanganese.	
	1907.	1908.	1909.	1908.
January	1,406,397	664,415	1,117,823	20,254
February	1,317,923	745,802	1,073,363	9,402
March	1,424,827	841,502	1,140,553	13,750
April	1,446,788	725,548	1,093,092	12,363
May	1,470,080	759,674	1,256,448	17,823
June	1,457,230	717,689	1,365,527	15,958
July	1,452,557	798,639	.....	10,250
August	1,445,685	897,052	.....	14,932
September	1,417,153	933,514	.....	8,938
October	1,514,521	996,481	.....	12,174
November	1,084,114	981,167	.....	15,882
December	659,459	1,090,339	.....	6,510

The number of active furnaces of the United States Steel Corporation and of the independent steel companies at the beginning of each month since January appears below:

	Steel Corporation.	Independent steel companies.
Furnaces in blast February 1.....	62	49
Furnaces in blast March 1.....	65	45
Furnaces in blast April 1.....	66	39
Furnaces in blast May 1.....	68	42
Furnaces in blast June 1.....	77	48
Furnaces in blast July 1.....	83	51

The Steel Corporation's foundry iron furnaces at Bessemer, Ala., are not included in the above figures.

Capacity in Blast July 1 and June 1.

The following table shows the weekly capacity of furnaces in blast July 1 and June 1, the furnaces blown in in June being rated on the records of previous performance:

Coke and Anthracite Furnaces in Blast.

Location of furnaces.	Total number of stacks.	July 1.		June 1.	
		Number in blast.	Capacity per week.	Number in blast.	Capacity per week.
New York:					
Buffalo	15	12	27,159	10	22,736
Other New York....	7	3	3,225	3	4,058
New Jersey.....	8	3	4,338	3	4,480
Spiegel	2	0	0	0	0
Pennsylvania:					
Lehigh Valley....	25	12	11,331	13	12,365
Spiegel	3	1	140	2	770
Schuylkill Valley....	15	7	10,734	7	10,528
Low. Susquehanna....	7	5	7,492	5	6,636
Spiegel	1	1	602	1	825
Lebanon Valley....	10	3	3,910	4	4,650
Pittsburgh Dist....	48	42	112,685	38	103,760
Spiegel	2	2	1,692	2	1,631
Shenango Valley....	20	14	28,507	12	25,151
West. Penn....	27	16	27,792	15	28,994
Maryland	4	2	4,560	2	4,613
Wheeling Dist....	14	10	24,654	9	20,860
Ohio:					
Mahoning Valley....	20	17	43,854	16	42,994
Central and North. and Michigan....	22	13	32,888	14	33,036
Hocking Val., Hang- ing Rock and S. W. Ohio.....	15	8	6,512	11	8,421
Illinois and Indiana....	28	23	62,209	20	56,224
Spiegel	2	1	1,052	2	1,694
Minnesota and Wis....	7	5	5,393	6	7,536
Missouri and Colorado	7	4	7,308	4	7,077
The South:					
Virginia	23	9	6,683	9	6,811
Kentucky	5	2	1,461	2	1,764
Alabama	46	17	23,150	18	24,608
Tennessee	18	7	4,398	6	4,074
Georgia and Texas....	3	0	0	0	0
Totals.....	404	239	463,729	234	446,096

The list of furnaces blown in in June or on July 1 includes Buffalo C and one Lackawanna at Buffalo, two Shoenberger, one Isabella and one Monongahela in the Pittsburgh district, Alice and Sharpsville in the Shenango Valley, Colonial and Saxton in Western Pennsylvania, Mingo No. 4 and Martin's Ferry in the Wheeling District, one South Chicago and one Gary in the Chicago district and Helen in Tennessee. Among furnaces blown out in June were one Crane and one Palmerton in the Lehigh Valley, Earliston in Western Pennsylvania, Sheridan in the Lebanon Valley, No. 2 Bellaire in the Wheeling district, Bessie in the Hocking Valley, Belfont and Hamilton (banked) in the Hanging Rock district, Thomas at Milwaukee, and one Clifton in Alabama.

A Record of Active Capacity.

The active weekly capacity in coke and anthracite iron has shown the following fluctuations since January 1, 1907, the figures representing gross tons:

	Capacity per week.		Capacity per week.
July 1, 1909.....	463,729	March 1.....	267,437
June 1.....	446,096	February 1.....	241,925
May 1.....	412,010	January 1, 1908.....	235,152
April 1.....	409,217	December 1, 1907.....	347,372
March 1.....	420,807	November 1.....	491,436
February 1.....	414,497	October 1.....	511,397
January 1, 1909.....	401,994	September 1.....	507,768
December 1, 1908.....	381,102	August 1.....	513,471
November 1.....	362,685	July 1.....	528,170
October 1.....	337,925	June 1.....	523,220
September 1.....	313,112	May 1.....	524,538
August 1.....	284,590	April 1.....	496,456
July 1.....	264,452	March 1.....	511,035
June 1.....	259,284	February 1.....	492,359
May 1.....	268,674	January 1, 1907.....	507,397
April 1.....	264,890		

NEWS OF THE WORKS.

Iron and Steel.

The No. 3 blast furnace of the Republic Iron & Steel Company at Thomas, Ala., will be blown out in the coming week for relining.

The Birmingham Coal & Iron Company is operating its No. 1 blast furnace at Boyles, Ala. It was blown in June 24, No. 2 having been blown out for relining June 20.

The Alice Furnace of the Tennessee Coal, Iron & Railroad Company at Birmingham, Ala., will probably be put in blast by August 1.

The furnace of the Williamson Iron Company at Birmingham, Ala., is being made ready for operation.

The Sheldon Axle Company, Wilkes-Barre, Pa., is building an addition to its spring plant equal to the present capacity, which will increase the output to about 2500 sets of carriage and automobile springs per day. The company started its spring plant 10 years ago, and the business has grown to such proportions that it has become necessary to increase the capacity to about 10,000 tons of springs per annum. The new plant will be devoted to the manufacture of high grade automobile springs exclusively. The company is also anticipating increasing its axle plant to include an already established line, which is constantly increasing, for commercial vehicles. The spring plant is expected to be in operation October 1.

The Lackawanna Steel Company had five furnaces in blast at West Seneca, N. Y., July 1, as against four furnaces June 1.

In the Pittsburgh District 44 blast furnaces were active July 1, an increase of four in June—two Shoenberger, one Isabella and one Monongahela.

Sheridan Furnace of the Berkshire Iron Works, at Sheridan, Pa., was blown out June 10 for relining and general repairs.

No. 1 Clifton Furnace of the Alabama Consolidated Coal & Iron Company, at Ironaton, Ala., was blown out in June for light repairs and is expected to resume this month.

General Machinery.

The Crocker-Wheeler Company, Ampere, N. J., has recently received an order from the De Laval Steam Turbine Company, Trenton, N. J., for one 1000 k. v. a. turbo generator; Smith Gas Power Company, Lexington, Ohio, 400 k. v. a. alternator; George A. Fuller Company, Chicago, Ill., three 250-volt generators, with total capacity of 500 kw.; National Sewing Machine Company, Belvidere, Ill., 325-kw. generator; Marshall Traction Company, 125-kw. generator; Northwestern Electric Company, Chicago, Ill., 100-kw. generator; Ingram-Richardson Mfg. Company, Beaver Falls, Pa., 100-kw. generator; Ohio Valley Clay Company, Steubenville, Ohio, two 100-kw. generators and eight compound wound motors with an aggregate of 295 hp.; Janesville Machine Company, Janesville, Wis., 350-kw. generator and 152 hp. of motors; Eastwood Wire Mfg. Company, Belleville, N. J., three 220-volt shunt wound motors aggregating 125 hp.

The business of Cyrus Currier & Sons, Newark, N. J., has been incorporated under the same name, with a capital stock of \$75,000, with the following officers: Francis S. Currier, president and general manager; Cyrus Currier, Jr., secretary and treasurer. Both of the officers have been connected for many years with the business, which has been carried on under the same name since 1842. The company carries on a general machine, foundry and pattern business, and in addition manufactures a large line of special machinery.

The receivership of the Jeanesville Iron Works, Hazleton, Pa., has been terminated, the company having made a satisfactory settlement with its creditors.

The Foster Machine Company has been incorporated at Elkhart, Ind., with \$25,000 capital stock, to do a general machine manufacturing business. The directors are W. Harry Foster, E. B. Zeigler and Marion E. Brady.

The Cincinnati Iron & Steel Company, Cincinnati, Ohio, has just completed installing a 30-ton electric crane in the plant

of the Cincinnati Traction Company; also secured an order for a 40-ton Case electric crane for the Nashville Railway & Light Company, Nashville, Tenn., and an order for a 180,000-lb. shear to cut 6-in. square material for the Goldberger Iron Company, Pittsburgh, Pa.

Recent installations of electrical machinery by the Westinghouse Electric & Mfg. Company, Pittsburgh, Pa., in the mining territory of Western States include: Anaconda Copper Mining Company, Anaconda, Mont., four 600-hp. motors, driving Root blowers, and two additional 600-hp. slow speed motors, driving high pressure air compressors for pneumatic locomotive service; Helena Power Transmission Company, Butte, Mont., turbine plant; Boston & Montana Mining & Smelting Company, Leonard mine, two 300-hp. couples of two 150-hp. motors, each direct connected to Nordberg pumps, and supplemented by 150-hp. motor driving an Aldrich pump.

The Geneva Cutlery Company, Geneva, N. Y., will equip its new building with machinery of its own manufacture, but later on the company may need an extra lathe or a planer, depending somewhat on business conditions.

The Western Motor Company, Marion, Ind., has under construction a new factory plant of reinforced concrete for the manufacture of the Rutenber gasoline motors and carburetors. It is expected that the factory will be completed and ready for occupancy early in August.

Foundries.

The Lobdell Car Wheel Company, Wilmington, Del., is to build an addition to its plant, 62 x 122 ft., of brick and steel construction.

The Miles Steel Casting Company will establish a plant at New Albany, Ind., to cost \$30,000. W. J. Miles, head of the company, is of Middletown, Ohio.

Power Plant Equipment.

The citizens of North Battleford, Saskatchewan, Canada, have voted bonds for \$100,000 for the establishment of a water works and sewerage system and electric light plant, work upon which will be commenced at an early date. S. Cookson is secretary and treasurer.

The city of Glendale, Cal., has voted bonds in the sum of \$60,000 for the installation of an electric light plant. I. G. B. Woodbery is city clerk.

A new municipal electric light plant being erected at Heber City, Utah, will be equipped with machinery furnished through the General Electric Company's Salt Lake City branch.

The Industrial Girls' School, Clearmont, Ind., is preparing plans for the installation of a pump and repairs in the power house which are expected to be ready by August 1. Charlotte Dye is superintendent.

The city of Yale, Mich., has purchased a 14 x 36 in. Lane & Bodley Corliss engine for installation in its electric light plant.

The Municipal Light & Power Company, San Francisco, Cal., has been incorporated with a capital stock of \$1,000,000, to furnish electricity and gas and to purchase and install gas and electric plants, the incorporators being Rudolph Spreckels, Claus A. Spreckels, Percival S. Scales, H. H. Sanford and Frank Harold.

The Arcadia Mills, Spartanburg, S. C., which is to build new buildings, adding about 10,000 new spindles and 250 Draper looms, has purchased practically all the machinery. The company, however, will need two boilers and some prominent make of engine.

The Commissioner of Water Works, Newport, Ky., will receive bids until July 15 for a 5,000,000-gal. vertical high duty pumping engine, a large quantity of cast iron pipe, special castings, &c., and one steel stand pipe on steel braced tower.

Fires.

The repair shops and roundhouse of the Tonopah & Goldfield Railroad, Tonopah, Nev., were burned June 29, the loss being estimated at \$100,000.

The I. F. Force Handle Company's plant at New Albany, Ind., was burned July 5 with a loss of \$30,000.

Hardware.

The McKinney Mfg. Company, N. S., Pittsburgh, Pa., manufacturer of hinges, screen door hardware, &c., is completing an addition to its plant, consisting of a steel frame and concrete four-story building, 60 x 70 ft., in which the tool room will be located, the balance of the space being for manufacturing purposes, which will increase the company's capacity in certain lines.

The Vincennes Washing Machine Company has been organized at Vincennes, Ind., to manufacture washing machines and wringers. The capital stock is \$10,000. The directors are Emil A. Ritterskamp, Benjamin Niehaus and Chester G. Ritterskamp.

The plant of the Cambria Forge Company, at Johnstown, Pa., was practically destroyed by fire July 6, causing a loss of about \$50,000. It is expected the plant will be rebuilt at once.

The Eccentric Wrench Company has been incorporated at Marion, Ind., with \$35,000 capital stock to manufacture nut

and pipe wrenches. The incorporators are Abraham Middleton, E. E. Sheckley and Wm. H. McGraw.

Kitselman Bros., Muncie, Ind., manufacturers of woven wire fence and fence making machinery, are building an addition to their plant for the machine department.

Miscellaneous.

The O. K. Seed Planter Company, St. Louis, Mo., has established a plant for the manufacture of seed planters. C. I. Trimble is president and treasurer; A. H. Thornburgh, secretary, and H. H. Givan, manager. The equipment has been purchased.

The Town Council of Hazleton, Ind., has decided to install a water system.

Edward D. Crawley, Danville, Ind., is at the head of a company organized there to build a plant to manufacture lightning arresters, a device for use on telephone, telegraph and electric light wires. The device is the invention of W. F. Hiatt. The company already has orders for 50,000 of the arresters.

The Milwaukee Aluminum Mfg. Company is having plans prepared for a two-story brick brass foundry, 40 x 140 ft., at Reed and South Pierce streets.

A blower system for heating, ventilation and disposal of waste, dust, &c., will be installed in the new plant of the Waukesha (Wis.) Motor Company, plans for which are now being prepared.

The National Brake & Electric Company, Milwaukee, now a subsidiary of the Westinghouse Air Brake Company, is having plans drawn for a new building, 50 x 90 ft., to be added to its pattern department.

An incineration plant, for which \$75,000 has been appropriated, will be built by the city of Antigo, Wis.

The Chicago & Milwaukee Electric Railroad has awarded contract to the General Electric Company for one 500-kw. rotary converter, three large air blast transformers and other substation apparatus.

Hugh L. Warner of Muncie, Ind., manufacturer of automobiles, has purchased a site in the city for a plant to manufacture automobile sundries, including gears.

The Rushville Gas, Heat & Water Company has been incorporated at Rushville, Ind., with \$100,000 capital stock. John A. Walters, Fred C. Carroll and Henry G. Walter, all of Indianapolis, are the directors.

The Louisville Brazing & Machine Company, Pittsburgh, Pa., has been granted a Delaware charter, with a capital of \$15,000. The incorporators are Fred C. Tygard, George R. Tygard and James W. Tygard, all of Pittsburgh.

The Richmond Safety Gate Company, Richmond, Ind., which manufactures automatic guards for elevator shafts, has sold its plant to C. B. Colby of Marshalltown, Iowa, to which city it will be moved. The company was capitalized at \$50,000. It has done a large business for years.

Kirkhoff Bros. & Co., Indianapolis, Ind., were awarded the contract for the heating plant for the new City Building at \$25,300. There were two lower bids and the Indiana Engineering Company, the lowest, has asked the court to restrain the city from letting the contract as made by the Board of Public Works.

The Perfection Metal Tie Company has been incorporated at Terre Haute, Ind., with \$20,000 capital stock, to manufacture railroad ties of metal and concrete. The directors are B. H. Pinnell, R. D. Robertson and W. H. Mayer.

The W. J. Rainey coke interests have started work on the building of 600 beehive coke ovens at Allison, near Brownsville, Pa.

The Bessemer Limestone Company, Youngstown, Ohio, recently re-elected directors and these officers at the annual meeting: Joseph G. Butler, Jr., president; C. C. Blair, secretary; C. M. Crook, treasurer and general manager.

The Ideal Lighting Company, Davenport, Iowa, manufacturer of individual gas systems, has increased its capital stock from \$25,000 to \$50,000. This action was taken on account of the large growth of the business, which last year was three times as great as the year previous.

The Dunbar Furnace Company, Dunbar, Pa., is installing a large dryer at its sand plant, which will be in operation about August 1, and will increase the capacity of the plant to about 850 tons per day. This sand is said to run about 99½ per cent. pure silica. In addition to making pig iron, the company furnishes sand for glass houses, building supply and steel casting purposes, and also for locomotive and concrete use.

The Washington Mfg. Company, Washington, Ind., will establish an automobile factory for which buildings have already been erected. William M. Brown is president.

Last November the fact was mentioned that the Lunkenheimer Company, Cincinnati, Ohio, had received from the Panama Canal Commission a very large order for Renewo globe, angle and cross valves. The order at that time covered upward of 7000 valves. This company has just received an additional order for Renewo valves, amounting in all to upward of

\$50,000, in spite of severe competition and lower prices. The Renewo valve has a renewable, self-cleansing seat, and the disk can also be replaced when worn. Owing to the ingenious construction of the seating faces, the seat will outwear many disks. It is not necessary in every case to replace these parts, as the regrinding feature (which the Lunkenheimer Company originated in another valve construction) is also embodied in the Renewo valve, so that if desired the seating faces can be reground and made tight without removing the valve from connecting pipes.

A plant for the manufacture of galvanized iron tanks will be opened in Sioux City, Iowa, by Hunt & Schuetz.

The Northwestern Expanded Metal Company, Chicago, Ill., has purchased the plant of the Jeannette Planing Mill Company, at Jeannette, Pa., and will remodel the buildings and install machinery for the manufacture of expanded metal lath. The company has all the machinery it will require for equipping this plant, which has a power plant of sufficient size to meet the company's requirements.

Harvey A. Moyer, 255 Wolf street, Syracuse, N. Y., will soon start construction on an automobile manufacturing plant to consist of a main building, five stories, 60 x 150 ft., and a blacksmith shop, one story, 30 x 125 ft. Contract for construction of the buildings has been awarded.

Trade Publications.

Rubber Mill Machinery.—Mesta Machine Company, Pittsburgh, Pa. Folder. Shows the works of the Mesta Machine Company and illustrates and describes a three-roll rubber calendar and a 20 and 22 in. by 72 in. rubber grinder and mixer.

Valves and Fittings.—The Ohio Brass Company, Mansfield, Ohio. Catalogue G, 6 x 9 in., 19 pages. Devoted particularly to the company's line of radiator valves, globe, angle and check valves. The more important equipment is described with the aid of sectional views, and prices are quoted.

Central Station Transformers.—Wagner Electric Mfg. Company, St. Louis, Mo. Several types of central station transformers are shown and the method of manufacturing is described. Attention is called to the adaptability of this equipment for quick repairs, as it is so constructed that parts can be easily replaced.

Carborundum.—The Carborundum Company, Niagara Falls, N. Y. Catalogue, 6½ x 9 in., 125 pages. Shows the company's works, describes the process of producing carborundum and illustrates the equipment used. The uses to which carborundum can be applied are covered, and some of the 100,000 different size grits and grades of wheels made by the company are illustrated. The book points out the best grades to use for different purposes, such as granite polishing, pearl grinding, &c. Rubbing bricks and stones and the uses to which they are applied are treated of and prices of the various equipment shown are listed.

Telephone Equipment.—Western Electric Company, New York. Two booklets. One is entitled "An International Achievement," and describes how the telephone service of Paris, which was burned out on September 20 last, was replaced by the above company within 30 days. The manner in which the equipment was installed is described, together with views of the burned out central station, and reproductions of newspaper articles describing the company's achievement are given. The other booklet is devoted to a series of advertisements showing the wide variety of uses to which the telephone can be put.

Engine Room Gauge Boards.—American Steam Gauge & Valve Mfg. Company, 208 Camden street, Boston, Mass. A number of designs of gauge boards are shown, including one with nine instruments in use at the Kingsland shops of the Lackawanna Railroad.

Lubricants.—Dearborn Drug & Chemical Works, Chicago, Ill. Booklet entitled "Lubrication versus Friction." Describes the various lubricants used and the composition entering into the more important ones. Following this the lubricants manufactured by the company are described and their process of manufacture.

Vertical Turret Lathes.—Bullard Machine Tool Company, Bridgeport, Conn. Catalogue, 9 x 11 in., 39 pages. Devoted to an extended and particularly well illustrated description of the design and uses of the vertical turret lathe, which is declared to combine the best features of the horizontal turret lathe and the vertical boring and turning mill. Illustrations and specifications of a 24-in. machine and a 36-in. machine are given, and the working parts are separately illustrated with large detail half-tone engravings. Other details of the setting of tools to perform various operations are illustrated with line drawings. In connection with a chart of the machine having all parts named, very complete operating instructions are given.

Lathes.—Gisholt Machine Company, Madison, Wis. Page for loose leaf catalogue. Describes the uses to which the Gisholt lathe can be put, with the aid of line drawings and a view of the working parts of the machine, and the method by which street car motor pinions are finished with this equipment.

The Iron and Metal Trades

All Markets Firmer.

Steel Works Production Increasing.

Merchant Furnaces Making Less Iron.

As yet there have been no developments of much significance in the struggle between the Amalgamated Association and the American Sheet & Tin Plate Company. It is of little importance, from the standpoint of the trade at large, so far as the sheet mills are concerned. In the tin plate end, where the proportion of union mills is much larger, the only noteworthy facts are that the Guernsey plant, hitherto union, is in operation, and that some of the mills of the plant at Ellwood, Ind., have been started. As indicating the future plans, it is significant that the United States Steel Corporation has authorized the building of an enormous addition to Gary, Ind., consisting of 50 sheet mills and 50 tin plate mills.

The independent tin plate mills which recognize the Amalgamated Association have signed the scale for another year. The leading Western independent sheet mills have also signed.

The returns of the producers of coke and anthracite pig iron made to *The Iron Age* show that the production during the first half of the current year was 11,000,000 tons, as compared with 9,018,014 tons during last half of 1908, 6,918,004 tons during the first half of that year, and a record of 13,478,044 tons during the first half of 1907. We are now running at a rate of 24,000,000 tons a year.

The production in June, a 30-day month, was 1,929,884 tons, as compared with 1,883,330 tons in May, a month of 31 days. It may be of interest to state that in all probability the output of the Steel Corporation furnaces during July is likely to establish a new record. The best achievement in its history was 1,008,000 tons in October, 1906.

The most significant feature of the blast furnace returns, however, is that the increase in output is due entirely to the furnaces connected with steel works. Their make jumped from 40,531 tons daily in May to 45,507 tons per day in June. The merchant furnaces on the other hand show a decline from a daily product of 20,222 tons in May to 18,822 tons in June. So far as we can judge from partial reports of stocks, the accumulations in the yards of the merchant furnace companies have shown little change during June.

The pig iron markets are firmer all round. Some of the Alabama interests appear to have booked more business during the past few weeks than appeared on the surface and are asking higher prices. During the last week a leading implement concern has bought from 20,000 to 30,000 tons, and good sized blocks have been purchased by other consumers. The market is now reaching a point where stocks of pig iron which have been persistently accumulated since the panic are being conservatively marketed.

Our Chicago correspondent reports that the most conspicuous feature of last week's transactions in finished material was the large amount of tonnage entered by the mills against contracts expiring on July 1. Whether required for immediate use or not, buyers were not inclined to risk the cancellation of these contracts made at bargain prices.

The majority of leading mills have advanced prices on plates and shapes to 1.35c., Pittsburgh, but 1.30c. is still being done in some quarters. Another lake boat calling for 4000 tons of material has been placed, and orders for 12,000 to 14,000 tons of plates are soon coming out for the Brooklyn water works.

There are good prospects for further work for the fabricators. During the week the Sewickley Bridge, requiring nearly 6000 tons, was awarded. In New York the Altman and Milbank buildings, aggregating 6500 tons, were placed. An order for 5000 tons of structural work for Canada has been taken.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type,
Declines in Italics.

At date, one week, one month and one year previous.

July 7, June 30, June 2, July 1,
1909. 1909. 1909 1908.

PIG IRON, Per Gross Ton:				
Foundry No. 2, standard, Philadelphia	\$16.50	\$16.50	\$16.25	\$16.50
Foundry No. 2, Southern, Cincinnati	15.75	15.25	14.50	15.25
Foundry No. 2, local, Chicago	17.00	16.50	16.50	17.85
Basic, delivered, Eastern Pa.	15.50	15.50	15.50	15.25
Basic, Valley furnace	15.00	15.00	14.25	15.00
Bessemer, Pittsburgh	16.15	16.15	15.90	16.90
Gray forge, Pittsburgh	14.65	14.90	14.65	14.90
Lake Superior charcoal, Chicago	19.50	19.50	19.50	20.00

BILLETS, &c., Per Gross Ton:				
Steel billets, Pittsburgh	23.00	23.00	23.00	25.00
Forging billets, Pittsburgh	27.00	27.00	25.00	27.00
Open hearth billets, Philadelphia	25.00	25.00	24.50	26.20
Wire rods, Pittsburgh	29.00	29.00	29.00	33.00
Steel rails, heavy, at mill	28.00	28.00	28.00	28.00

OLD MATERIAL, Per Gross Ton:				
Steel rails, melting, Chicago	14.50	14.50	14.75	12.50
Steel rails, melting, Philadelphia	16.00	16.00	15.50	13.50
Iron rails, Chicago	17.00	17.00	17.00	15.50
Iron rails, Philadelphia	19.50	19.50	18.50	18.00
Car wheels, Chicago	16.00	16.00	15.25	13.00
Car wheels, Philadelphia	15.25	15.25	15.00	13.50
Heavy steel scrap, Pittsburgh	16.00	16.00	15.75	14.00
Heavy steel scrap, Chicago	14.00	14.50	14.50	11.50
Heavy steel scrap, Philadelphia	16.00	16.00	15.50	13.50

FINISHED IRON AND STEEL,				
Per Pound:	Cents.	Cents.	Cents.	Cents.
Refined iron bars, Philadelphia	1.45	1.45	1.40	1.35
Common iron bars, Chicago	1.35	1.35	1.30	1.50
Common iron bars, Pittsburgh	1.45	1.45	1.30	1.40
Steel bars, tidewater, New York	1.41	1.41	1.36	1.56
Steel bars, Pittsburgh	1.25	1.25	1.20	1.40
Tank plates, tidewater, New York	1.46	1.46	1.41	1.76
Tank plates, Pittsburgh	1.30	1.30	1.25	1.60
Beams, Pittsburgh	1.30	1.30	1.25	1.60
Beams, tidewater, New York	1.46	1.46	1.41	1.76
Angles, Pittsburgh	1.30	1.30	1.25	1.60
Angles, tidewater, New York	1.46	1.46	1.41	1.76
Skelp, grooved steel, Pittsburgh	1.30	1.30	1.30	1.45
Skelp, sheared steel, Pittsburgh	1.40	1.40	1.40	1.50

SHEETS, NAILS AND WIRE,				
Per Pound:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.20	2.20	2.20	2.50
Wire nails, Pittsburgh	1.70	1.70	1.70	1.95
Cut nails, Pittsburgh	1.70	1.65	1.65	1.75
Barb wire, galv., Pittsburgh	2.00	2.00	2.00	2.40

METALS, Per Pound:				
	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	13.25	13.37½	13.50	12.87½
Electrolytic copper, New York	13.00	13.12½	13.25	12.62½
Spelter, New York	5.35	5.35	5.20	4.50
Spelter, St. Louis	5.27½	5.27½	5.05	4.35
Lead, New York	4.35	4.35	4.35	4.50
Lead, St. Louis	4.30	4.30	4.25	4.40
Tin, New York	29.00	29.15	29.10	27.20
Antimony, Hallett, New York	7.50	7.50	7.75	8.25
Nickel, New York	45.00	45.00	45.00	45.00
Tin plate, 100 lb., New York	\$3.64	\$3.64	\$3.64	\$3.89

Prices of Finished Iron and Steel F.O.B. Pittsburgh.

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 20c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 80c. on plates, structural steels and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets, No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Structural Shapes.—I-beams and channels, 3 to 15 in., inclusive, 1.30c. to 1.35c., net; I-beams over 15 in., 1.40c., net; H-beams over 8 in., 1.50c.; angles, 3 to 6 in., inclusive, ¼ in. and up, 1.35c., net; angles, over 6 in., 1.40c., net; angles, 3 x 3 in. and up, less than ¼ in., 1.50c., base, half extras, steel bar card tees, 3 in. and up, 1.40c., net; zees, 3 in. and up, 1.35c., net; angles, channels and tees, under 3 in., 1.25c., base, plus 10c., half extras, steel bar card; deck beams and bulb angles, 1.60c., net; hand rail tees, 2.70c., net; checkered and corrugated plates, 2.70c., net.

Plates.—Tank plates, ¾ in. thick, 6¼ in. up to 100 in. wide, 1.30c. to 1.35c., base. Extras over this price are as follows:

Tank, ship and bridge quality, ¼-in. thick on edges, 100 in. wide, down to but not including 6 in. wide, is taken as base.

Steel plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, shall be considered $\frac{1}{4}$ -in. plate. Steel plates over 72 in. wide must be ordered $\frac{1}{4}$ -in. thick on edge, or not less than 11 lb. per square foot, to take base price. Steel plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. shall take the place of 3-16-in.

Percentages as to overweight on plates, whether ordered to gauge or weight, to be governed by the Association of American Steel Manufacturers' Standard Specifications.

Gauges under $\frac{1}{4}$ -in. to and including 3-16-in. plates on thin edges.....	\$0.10
Gauges under 3-16-in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
All sketches (excepting straight taper plates varying not more than 4 in. in width at ends, narrowest end being not less than 30 in.).....	.10
Complete circles.....	.20
Boiler and flange steel plates.....	.10
"A. B. M. A." and ordinary firebox steel plates.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Shell grade of steel is abandoned.....	
For widths over 100 in. up to 110 in.....	.05
For widths over 110 in. up to 115 in.....	.10
For widths over 115 in. up to 120 in.....	.15
For widths over 120 in. up to 125 in.....	.25
For widths over 125 in. up to 130 in.....	.50
For widths over 130 in.....	1.00

TERMS.—Net cash 30 days. Pacific Coast base, 1.30c. f.o.b. Pittsburgh.

Sheets.—Minimum prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual advances for small lots from store, are as follows: Blue annealed sheets, No. 10 and heavier, 1.65c.; Nos. 11 and 12, 1.70c.; Nos. 13 and 14, 1.75c.; Nos. 15 and 16, 2.05c.; box annealed sheets, Nos. 17 to 21, 2c.; Nos. 22 to 24, 2.05c.; Nos. 25 and 26, 2.10c.; No. 27, 2.15c.; No. 28, 2.20c.; No. 29, 2.25c.; No. 30, 2.35c. Galvanized sheets, Nos. 13 and 14, 2.25c.; Nos. 15 and 16, 2.35c.; Nos. 17 to 21, 2.50c.; Nos. 22 to 24, 2.65c.; Nos. 25 and 26, 2.85c.; No. 27, 3.05c.; No. 28, 3.25c.; No. 29, 3.25c.; No. 30, 3.60c. Painted roofing sheets, No. 28, 1.55c. per square. Galvanized roofing sheets, No. 28, 2.80c. per square for $2\frac{1}{2}$ -in. corrugations.

Wrought Pipe.—Discounts on steel pipe, $\frac{3}{4}$ to 6 in., in carloads to the largest trade, are 81 and 5 per cent. off list, and on iron pipe, $3\frac{1}{2}$ to 6 in., are 78 and 5 per cent. off list.

Boiler Tubes.—Regular discounts are as follows:

Boiler Tubes.	Steel.
1 to $1\frac{1}{4}$ in.....	.50
$1\frac{3}{4}$ to $2\frac{1}{4}$ in.....	.62
$2\frac{3}{4}$ to 5 in.....	.70
$2\frac{1}{2}$ in.....	.64
6 to 13 in.....	.62
$2\frac{1}{2}$ in. and smaller, over 18 ft. long, 10 per cent. net extra.	
$2\frac{1}{2}$ in. and larger, over 22 ft. long, 10 per cent. net extra.	

Wire Rods.—Bessemer rods, \$29; chain rods, \$29; basic rods, \$29 to \$30.

Chicago.

FISHER BUILDING, July 7, 1909.—(By Telegraph.)

The most conspicuous feature of last week's transactions in finished material was the large amount of tonnage entered by the mills against contracts expiring July 1. Whether required for immediate use or not, buyers generally were not inclined to risk the cancellation of these contracts made at bargain prices, and a very large percentage of the quantity included in them was taken out. There is a decidedly stronger feeling as to values in all divisions of the market. This was definitely manifested in an actual advance of \$1 a ton on plates, shapes and bars by all of the principal Eastern mills. The fact that a corresponding advance has not been made by local mills of the leading interest emphasizes the fact that, while conditions may at times warrant the maintenance of prices equivalent to those of Pittsburgh, plus the full freight differential, the purpose is to hold this market on an independent basis. As the finishing capacity of this district grows with the completion of new mills, this tendency will be more marked. It is emphatically stated that local conditions will in the future govern local prices regardless of the Pittsburgh market, which it is declared has not been recognized for several months as a determining factor on a basis of full freight added in establishing Chicago prices. Although the heaviest tonnage of pig iron placed by the Northern furnaces last week was taken by an implement interest, the railroad supply foundries participated in the buying to a greater extent than for some time. Whether the new scale of prices fixed by the advance this week of 50c. a ton on both Northern and Southern iron will ultimately prevail in actual transactions is a matter to be determined by future developments.

Billets and Rods.—Prices on semifinished steel have stiffened up within the past week, and \$27, base, Chicago, is now regarded as the minimum on forging billets. An order for 1000 tons has been entered by the leading interest at this figure. Another maker of billets has advanced prices \$2 above its recent minimum, and is now asking \$28 for forging billets. There is an inquiry from a Kansas City consumer for 400 tons of 4 x 4 in. rolling billets, and a Milwaukee manufacturer is in the market for a car lot of forging billets. We quote on forging billets \$27 to \$28, base, Chicago. Wire

rods are unchanged at the "f.o.b. Pittsburgh" prices quoted elsewhere.

Rails and Track Supplies.—New rail orders to the amount of 8000 tons were entered last week by the Illinois Steel Company, of which 5000 tons, constituting a single order, was placed by a Western road; these rails, being open hearth, will be rolled at Gary. The remainder of the tonnage was composed of miscellaneous lots from various sources. The early purchase of 30,000 tons now under consideration is expected. There are also a number of inquiries in the market emanating from the construction of new steam and traction lines; several of these represent enterprises which were arrested by the financial panic two years ago and have since lain dormant. That some of them are about to be revived and put through is indicated by these inquiries. One for a new steam road calling for 12,000 tons of 80-lb. rails is being figured on. Specifications for track fastenings are very heavy, and there is good prospect for a large volume of business yet to be placed by the roads. The Joliet mills are already sold up so far ahead on track bolts as to be practically out of the market. Prices on railroad spikes are firm at 1.75c. to 1.85c., base, and on small spikes at 1.85c. to 1.95c., base, Chicago. Light rail tonnage is increasing, and prices are pretty evenly held at the following quotations: 40 to 45 lb. sections, \$26; 30 to 35 lb., \$26.75; 16, 20 and 25 lb., \$27; 12-lb., \$28, Chicago, less 50c. a ton on lots under 500 tons and \$1 a ton on lots over 500 tons.

Structural Material.—It is estimated that the aggregate of fabricated contracts booked during the first half of the year amounted to 600,000 tons; this is not far short of the total shop capacity, which is generally reckoned at 1,500,000 tons annually. Among last week's contracts were 500 tons for an addition to the plant of the Davenport Locomotive Works, Davenport, Iowa, which went to the McClintic-Marshall Construction Company, and 325 tons for the King Phillips Copper Company, Winona, Mich., which will be fabricated by the Wisconsin Bridge Company. Orders were also placed by the Chicago, Milwaukee & St. Paul for 700 tons of bridge material with the Toledo Massillon Bridge Company and 335 tons with the Fort Pitt Bridge Works. Eight highway bridges placed by the Commissioners of Henry County, Ill., went to the Joliet Bridge & Iron Works, and a small tonnage for the Alpine State Tabernacle was secured by the H. A. Silver Company, Salt Lake City, Utah. The Ralston Iron Works, San Francisco, secured 350 tons to be used in the construction of the Praeger Building. The Oregon Short Line, it is reported, will require a large amount of material for new bridges, the largest of which is to span the Columbia River. Specifications for plain material continue to come into the mills at a rate that prevents their catching up on deliveries which are now running from four to five weeks behind. The market is gradually firming up and the leading Eastern mills have advanced \$1 a ton and are now holding at 1.35c., Pittsburgh. The Inland Steel Company has moved its price up to the same level. The price schedule of the Illinois Steel Company, however, remains unchanged, and we therefore quote 1.48c., Chicago, as the effective minimum for this market.

Plates.—While mill bookings have not been augmented by any individual orders of exceptional size, the general demand is good and is becoming more widely distributed. An unusually large tonnage of specifications was received last week on contracts expiring July 1, and, while it is not expected that this average will be sustained through the present month, any slack-up that may occur will not interfere with the active operation of mills. The sheared plate mill at the South Works of the Illinois Steel Company has its rolling schedule filled 30 days ahead, but the universal mill is not so well provided, and the prompt delivery of universal sizes is available. The Carnegie Steel Company and the leading Eastern independent mills have advanced \$1 a ton and are quoting on a basis of 1.35c., Pittsburgh. The local market is unchanged and we quote 1.48c., Chicago, on $\frac{1}{4}$ -in. and heavier, with the usual advances for widths.

Sheets.—The demand for sheets continues to improve and under the growing volume of business prices have become stronger and steadier. The possibility of decreased production as a result of labor controversies in some mills has also tended to stiffen prices, which, though not absolutely firm, are subject to but little shading. With deliveries beginning to lengthen out so that a number of mills are unable to promise shipment inside of four or five weeks, jobbers' stocks are being resorted to more freely for prompt requirements. The demand for blue annealed sheets is especially good, and mills that are able to ship promptly are getting premiums of \$1 or more a ton for prompt service.

Bars.—Specifications against contracts expiring July 1 have for the past week or two been very heavy. The requirements for current consumption are scarcely great enough to take care of all this tonnage, a part of which will doubtless go to increase stocks in the hands of buyers. A quieter movement is expected through July, which is usually a quiet month with the manufacturers of farm implements. The leading Eastern mills are holding at 1.25c., Pittsburgh, as a minimum price on steel bars, as is one of the local inde-

pendent mills. The Illinois Steel Company is still quoting 1.38c., Chicago, at which level the market is firmly maintained. The Moline, East Chicago and East St. Louis mills of the Republic Iron & Steel Company shut down July 1 for inventory and repairs, expecting to start up again about the middle of the month if pending wage scale negotiations are successfully concluded by that time. Trade in bar iron, though somewhat more active, is comparatively light. Prices, however, are gradually firming up and the market is fairly steady at 1.35c. for early shipments, with some mills asking 1.40c. on deliveries extending through the remainder of the year. An inquiry for 2200 tons recently put out by the Illinois Central has been cut to 1000 tons, but the order, it is understood, has not yet been placed.

Pig Iron.—The upward tendency of pig iron has had the effect of bringing out a number of hesitating orders, and as a result an active buying movement, principally in Northern iron, developed last week. The heaviest transaction included a purchase by a leading implement interest of a round lot of foundry iron variously estimated at 20,000 to 30,000 tons. In any event, this order, together with several others of fair size, mostly for malleable iron, secured by local interests, were of sufficient volume to bolster up the market which for some time had lacked a satisfactory degree of steadiness. The leading Northern furnaces in this district which were last week selling at \$16, furnace, have advanced the price 50 cents a ton, and now emphatically declare that \$16.50 is the best they will do on last half iron; they also state that the usual differentials between grades will be rigidly observed. While the sellers of Southern iron report no sales of importance in this market, the furnaces they represent are said to be well sold up and are not inclined to book orders for future delivery at better than \$12.50, Birmingham. The leading Southern interest is practically out of the market. It is not believed that there are any consumers whose needs are urgent enough to induce them to take on much iron at the advanced price, and a temporary lull will probably follow. Enough business has been taken, however, to supply the present active furnace capacity through the third quarter at least, by which time it is hoped that the general improvement of industrial conditions will so increase consumption as to at least assure the permanency of existing values. It is possible that there is some prompt iron to be had at \$12, Birmingham, but none of the furnaces represented in this market is quoting that figure. It should be noted with reference to the quotations given below that the actual market is represented by the inside figures, the upward spread of 50 cents a ton being at this time merely nominal. The following quotations are for July, August and September delivery, f.o.b. Chicago:

Lake Superior charcoal.....	\$19.50 to \$20.00
Northern coke foundry, No. 1.....	17.00 to 18.00
Northern coke foundry, No. 2.....	17.00 to 17.50
Northern coke foundry, No. 3.....	16.50 to 17.00
Northern Scotch, No. 1.....	18.00 to 18.50
Southern coke, No. 1.....	17.35 to 17.85
Southern coke, No. 2.....	16.85 to 17.35
Southern coke, No. 3.....	16.35 to 16.85
Southern coke, No. 4.....	15.85 to 16.35
Southern coke, No. 1 soft.....	17.35 to 17.85
Southern coke, No. 2 soft.....	16.85 to 17.35
Southern gray forge.....	15.35 to 15.85
Southern mottled.....	15.10 to 15.60
Malleable Bessemer.....	17.00 to 17.50
Standard Bessemer.....	17.90 to 18.15
Jackson Co. and Kentucky silvery, 6 %.....	19.90 to 20.40
Jackson Co. and Kentucky silvery, 8 %.....	20.90 to 21.40
Jackson Co. and Kentucky silvery, 10 %.....	21.90 to 22.40

Old Metals.—The market continues inactive. Some copper is moving on contract specifications, but new demand is light and prices are $\frac{1}{4}$ c. lower. Spelter is also weaker, and there is little doing in lead. The demand for old metals has fallen off, but prices are not quotably lower. Quotations are as follows: Casting copper, $13\frac{1}{4}$ c.; lake, $13\frac{3}{4}$ c., in car lots, for prompt shipment; small lots, $\frac{1}{4}$ c. to $\frac{3}{4}$ c. higher; pig tin, car lots, 31c.; small lots, 33c.; lead, desilverized, 4.50c. to 4.60c., for 50-ton lots; corroding, 4.75c. to 4.85c., for 50-ton lots in car lots, $2\frac{1}{4}$ c. per 100 lb. higher; spelter, 5.35c. to 5.45c.; Cookson's antimony, $10\frac{1}{2}$ c., and other grades, 9 $\frac{1}{4}$ c. to $10\frac{1}{4}$ c.; sheet zinc is \$7, f.o.b. La Salle, in car lots of 600-lb. casks. On old metals we quote: Copper wire, crucible shapes, $13\frac{1}{4}$ c.; copper bottoms, $11\frac{1}{4}$ c.; copper clips, $12\frac{1}{4}$ c.; red brass, 12c.; yellow brass, 9 $\frac{1}{4}$ c.; light brass, 7c.; lead pipe, $4\frac{1}{4}$ c.; zinc, 4.75c.; pewter, No. 1, 23c.; tin foil, 23c.; block tin pipe, 26c.

Boiler Tubes.—There is a slightly better demand for merchant tubes, but as compared with the movement of other mill products the progress toward normal activity is discouragingly slow. The railroads are buying locomotive tubes only in such small lots as are needed for current requirements.

Cast Iron Pipe.—There were several municipal lettings last week, mostly in small Western towns, but none for any tonnage of individual importance; these were generally awarded to contractors. The principal business entered last week by the pipe foundries was made up of current orders, which were fairly numerous. We quote, per net ton, Chicago, as follows: Water pipe, 4 in., \$27.50; 6 to 12 in., \$26.50; 16 in. and up, \$25.50, with \$1 extra for gas pipe.

Merchant Pipe.—The business originating in this district is almost wholly confined to the regular sizes of merchant pipe, and is therefore regulated by the extent of building and machinery construction. Increasing activity in these lines is bringing out more liberal orders from the jobbers, and the volume of business is steadily growing. Regular discounts are well maintained.

Old Materials.—Last week developed very little trading in old material, and the market is distinctly weaker. Even melting steel is not as firm as it was a week ago, and the leading consumers who were eager for such material a short time since are not actively in the market. Notwithstanding the softness of prices it is generally believed by those closest in touch with the situation that no extensive reaction will be experienced. Dealers, in fact, are not disposed to sell short at the present market for deliveries running far ahead, and no large quantities are being offered at sacrifice prices. On the other hand, dealers are not finding a ready market for car lots of material arriving on track, and liberal concessions from current quotations are frequently necessary to effect sales. On a railroad list closed last week springs, knuckles and couplers brought \$13.25 and railroad malleable \$12.95 per net ton, and melting steel \$14.30 per gross ton. Only one of the local bar mills is taking on additional supplies, and it is only buying when bargain prices are offered. The following prices are per gross ton, f.o.b. Chicago:

Old iron rails.....	\$17.00 to \$17.50
Old steel rails, rerolling.....	15.50 to 16.00
Old steel rails, less than 3 ft.	14.50 to 15.00
Relaying rails, standard sections, sub- ject to inspection.....	22.50 to 23.50
Old car wheels.....	16.00 to 16.50
Heavy melting steel scrap.....	14.00 to 14.50
Frogs, switches and guards, cut apart.....	14.00 to 14.50
Mixed steel.....	11.50 to 12.00

The following quotations are per net ton:

Iron fish plates.....	15.00 to 15.50
Iron car axles.....	18.00 to 18.50
Steel car axles.....	17.25 to 17.75
No. 1 railroad wrought.....	13.00 to 13.50
No. 2 railroad wrought.....	12.00 to 12.50
Springs, knuckles and couplers.....	13.00 to 13.50
Locomotive tires, smooth.....	14.75 to 15.25
No. 1 dealers' forge.....	11.00 to 11.50
Mixed bushing.....	7.75 to 8.25
Steel axle turnings.....	9.50 to 10.00
Machine shop turnings.....	7.75 to 8.25
Cast borings.....	5.75 to 6.25
Mixed borings, &c.....	5.75 to 6.25
No. 1 mill.....	7.00 to 7.50
No. 2 mill.....	6.00 to 6.50
No. 1 boilers, cut to sheefs and rings.....	10.00 to 10.50
No. 1 cast scrap.....	13.50 to 14.00
Stove plate and light cast scrap.....	11.25 to 11.75
Railroad malleable.....	12.50 to 13.00
Agricultural malleable.....	11.25 to 11.75
Pipes and flues.....	9.00 to 9.50

Birmingham.

BIRMINGHAM, ALA., July 5, 1909.

Pig Iron.—The asking price of such producing interests as are solicitous of orders has been advanced an additional 50c. per ton, and the market for early shipments is believed to be correctly represented by the schedule of \$12.50, Birmingham. For last quarter deliveries there is as yet no established quotation. Producers are in all cases indifferent as to such commitments, and while the trade is disposed to pursue a conservative course, the action of the producing interests seems warranted. The fact that order books of all concerns represent a satisfactory tonnage is indicated by the manner in which stocks have been reduced and the rate of daily movement when compared with the output. A leading interest has announced to the trade its temporary withdrawal from the market; another large maker quotes \$13, Birmingham, for strictly third quarter shipments, and in still another case the \$12.50 basis would be accepted only for such grades and quantities as are necessary to be stocked from the present make. One of the smaller companies refused within the week a firm offer of \$12.50 for 3000 tons, to be delivered through the last half, and could not be induced to enter any part of the order at the price named. The sale of some 20,000 tons for early shipment was effected by a large producer at from \$12.50 to \$13 per ton, Birmingham. A lot of 2500 tons for third quarter shipment is reported sold at \$12.50 per ton, which price was received for lots of 1000 and 500 tons each for delivery, commencing immediately. Recent inquiries have generally concerned last quarter requirements with an occasional request for quotations on first quarter of 1910 shipments. The demand for low grades is phenomenal and far in excess of the supply owing to the results obtained from furnace operations for some months past. A change in the active capacity at furnace plants will be effected during the coming week, and it is probable that a larger output will result.

Cast Iron Pipe.—The most promising indications to local concerns just at this time are from the State of Kentucky, wherein an attractive tonnage of 20-in. water pipe is soon to be required. Notwithstanding the absence of large municipal contracts among recent transactions, the producing capacity is still well provided for and continuous

operation at all plants is expected. Quotations are unchanged, but the small orders placed have brought a higher average price than for some months, and it is understood that prices quoted would be shaded but little, if any, on round lots. We quote water pipe as follows, per net ton, f.o.b. cars here: 4 to 6 in., \$25; 8 to 12 in., \$24; over 12-in., average \$22 to \$23, with \$1 per ton extra for gas pipe.

Old Material.—Dealers' quotations are revised, and a better feeling generally prevails. Some contracts of fair proportions have been entered into, and the movement from yards is considerably increased over last reports. A rather desultory demand has been represented in recent transactions, but the outlook is much improved. We quote dealers' asking prices as follows, which are firm for carload lots:

Old iron rails.....	\$14.00 to \$14.50
Old iron axles.....	14.50 to 15.00
Old steel axles.....	12.00 to 12.50
No. 1 railroad wrought.....	12.00 to 12.50
No. 2 railroad wrought.....	10.00 to 10.50
No. 1 country wrought.....	9.50 to 10.00
No. 2 country wrought.....	9.00 to 9.50
No. 1 machinery.....	10.50 to 11.00
Tram car wheels.....	10.50 to 11.00
Standard car wheels.....	12.00 to 12.50
Stove plate and light cast.....	9.00 to 9.50
Cast borings.....	4.50 to 5.00
No 1 steel.....	10.50 to 11.00

Philadelphia.

PHILADELPHIA, PA., July 6, 1909.

The usual holiday dullness prevails in nearly all branches of the trade. A general suspension, usually covering three days, but with some manufacturers extended for a longer period to facilitate repairs, and the customary semiannual stock taking is to be noted. While there was a pretty fair run of business in some lines of finished materials toward the close of last week, transactions in the early portion of the present week have been insignificant. Prices on all classes of crude and finished materials, while no higher, are strong and being fully maintained.

Pig Iron.—Prices are firm, and in a number of cases moderate, and small lots of foundry iron have been sold at the top quotation for third quarter delivery. Furnaces generally are in a comparatively strong position. With a number of them the capacity for shipment over the next few months has been contracted for; in fact, several producers are now falling behind in their deliveries. Sales of foundry grades have shown a materially increased tonnage in the past month as compared with May. A number of idle stacks are ready to go in blast, but producers wish either an increased tonnage on their books or slightly higher prices before increasing their active capacity. The bulk of the business in the higher foundry grades has been for fairly prompt shipment and at \$16, furnace, for No. 2 X, equal to from \$16.50 to \$16.75, delivered, dependent upon the freight rate. The greater portion has been at the higher level, although sales by nearby furnaces have been at the lower rate. A further movement in low grade foundry iron is noted. Several transactions in lots of 1000 tons and upward have been reported, the ruling price being \$15.25, delivered. Low grade irons, however, are not plentiful, and a number of sellers are firm at an advance of 25c. a ton for those grades. Forge iron has not been active; several moderate sales are reported, including one of 500 tons for early shipment at \$15.25, delivered. The demand for Virginia foundry irons has been somewhat quieter. Sales of small lots of No. 2 X and No. 2 plain are reported at the market, while one sale of several thousand tons of pipe iron was made for consumption in the local territory. Steel making grades of iron have been dull. Prices range as follows for standard grades delivered in buyers' yards, eastern Pennsylvania and nearby points during the third quarter:

Eastern Pennsylvania, No. 2 X foundry.....	\$16.50 to \$16.75
Eastern Pennsylvania, No. 2 plain.....	16.00 to 16.25
Virginia, No. 2 X foundry.....	16.50 to 17.00
Virginia, No. 2 plain.....	16.25 to 16.75
Gray forge.....	15.25 to 15.50
Basic.....	15.50
Low phosphorus.....	19.50 to 20.00

Ferromanganese.—The market has been rather quiet and prices show no change. From \$41.50 to \$42, f.o.b. Baltimore, is named for delivery over the balance of the year, with \$42.50 to \$43.50 quoted for delivery during the first half of next year.

Billets.—The market is dull. While there is very little inquiry for rolling billets, moderate lots of forging steel are being taken for prompt shipment. Few inquiries of any size are before the trade and prices are unchanged at \$25 to \$25.50 for ordinary rolling billets delivered in this territory. Forging steel takes the usual \$2 a ton advance, the customary extras applying for high carbons and special sizes.

Plates.—Quite a good volume of orders came out during the closing days of last week, but business since the holiday has been quiet. The demand recently has been general, that for bridge plates probably leading, although that for the other grades has also been good. Mills are steadily increasing the tonnage of orders on their books and a larger

productive capacity is to be noted, some works now slightly exceeding 80 per cent. of their capacity. Prices are fully maintained at 1.45c. to 1.55c. for ordinary plates for prompt delivery in this territory.

Structural Material.—Mills continue to book a good volume of business, but no large contracts have been placed here. The Philadelphia & Reading has not yet let the contract for work on its Ninth street elevated, bids for which are in hand. Prices are firm, at 1.45c. to 1.55c., according to specification, for local delivery.

Sheets.—The demand is rather quiet and mills are pretty generally closed for the usual midsummer repairs. Orders are mostly for small spot lots, largely supplied from stock. Prices are firmly maintained, ranging as follows for nearby delivery: Nos. 18 to 20, 2.40c.; Nos. 22 to 24, 2.50c.; Nos. 25 and 26, 2.60c.; No. 27, 2.70c.; No. 28, 2.80c.

Bars.—Current business is in small lots for reasonably prompt shipment. A number of mills are idle, making the usual repairs. Prices are unchanged, the leading mills holding refined iron bars at 1.40c., f.o.b. mill, equal to 1.45c. to 1.50c., delivered. Steel bars are rather inactive, with prices ranging from 1.40c. to 1.45c., delivered.

Coke.—A little better movement is noted. A sale of some 15,000 tons of furnace coke on a sliding scale, delivered during the balance of the year, is reported by one seller. Standard Connellsville furnace coke is now quoted at \$1.75, at oven, for forward shipment, and there seems to be less spot coke around. Foundry coke is a trifle firmer, and a few moderate sized sales for forward delivery are reported at prices ranging from \$2.10 to \$2.25, at oven. For delivery in this vicinity the following range of prices is named:

Connellsville furnace coke.....	\$3.90 to \$4.10
Foundry coke.....	4.35 to 4.50
Mountain furnace coke.....	3.50 to 3.70
Foundry coke.....	3.80 to 4.10

Old Material.—Transactions have been light, the market showing the usual holiday dullness. Purchases in some cases are also held up, pending the closing of the usual monthly railroad offerings. A few moderate transactions in heavy melting steel are reported at \$16, delivered. Rolling mill scrap is still weak in some grades. Prices, while to some extent nominal, are unchanged, the following range being named for delivery in buyers' yards, eastern Pennsylvania and nearby points:

No. 1 steel scrap and crops.....	\$16.00 to \$16.50
Low phosphorus.....	20.00 to 20.50
Old steel axles.....	21.00 to 21.50
Old iron axles.....	23.25 to 24.00
Old iron rails.....	19.50 to 20.50
Old car wheels.....	15.25 to 15.75
Choice No. 1 R. R. wrought.....	17.50 to 18.00
Machinery cast.....	15.00 to 15.50
Railroad malleable.....	14.50 to 15.00
Wrought iron pipe.....	14.50 to 16.00
No. 1 forge fire scrap.....	13.50 to 14.00
No. 2 light iron.....	9.50 to 10.00
Wrought turnings.....	12.50 to 13.00
Stove plate.....	12.50 to 13.50
Cast borings.....	10.50 to 11.00
Grate bars.....	13.50 to 14.00

Cincinnati.

CINCINNATI, OHIO, July 7, 1909.—(By Telegraph.)

For one of the shortest business weeks of the year the past one has been most noteworthy in a market way. The speculative spirit developed late in June has in its operations advanced the price of pig iron \$1 a ton and induced a remarkable independence on the part of the Southern furnaces. The heavy buying of finished material has also strengthened prices all along the line, especially structural shapes. The only branch of trade showing weakness is the scrap market, prices being off on almost every item. Machinery men all report indications favorable for business from now on.

Pig Iron.—From a furnace viewpoint the Southern market is undoubtedly stronger. Practically all business must be submitted. It is a peculiar situation and not a little puzzling. The quoted price on Alabama irons is to-day \$12.50, Birmingham, for No. 2, with a higher price asked for special irons. Sentimentally, the range seems to be \$12 to \$12.50, Birmingham, but it is difficult to authenticate the advance, as it is equally puzzling to bring out late sales at the minimum figure, for aside from the reported heavy buying of the International Harvester, the American Radiator and the pipe interests, current inquiries are not developing sales to-day to the smaller melters. Tending to confirm the justice of the outside figure on Alabama irons, an offer of \$12, Birmingham, for 5000 tons was refused through one of the larger local agencies. A Southern furnace interest having a small supply of high grade foundry is not unwilling to accept to-day \$12, Birmingham, from customers who are melters. The price may be withdrawn to-morrow. The Republic Company is firm at \$12.50 for fourth quarter, with nothing to offer for the third. Rockwood is reported sold up. Rockdale blew out July 2, and is reported firm at the top quotation. There appears to be little change in the Northern situation save that the market seems a trifle stronger, and with the rapid advances on Southern iron will likely

come into more general notice. At the present quotations southern Ohio irons are relatively lower than Valley, and some good sales of malleable are indicated for the week at around \$14.50. Returning to the Southern situation, it looks as though \$12.50 might be the minimum buying figure for the week is over. The heavy take of the pipe companies, coupled with the fact that comparatively little forge and No. 4 foundry have been made this summer, constitutes these irons really the most popular in the late selling. Some agencies are asking \$11.25 for forge and \$11.50 for No. 4 foundry, although there appears to be a limited quantity of forge available at \$11. High silicons are unchanged. There is practically no demand for basic in this territory. An inquiry from a northern Ohio stove foundry is for 1800 tons of foundry iron. A central Ohio melter of malleable is in the market for 2000 tons for the last quarter. Some engine builders are inquiring for fourth quarter iron. For prompt delivery and through the third quarter, based on freight rates of \$3.25 from Birmingham and \$1.20 from the Hanging Rock District, f.o.b. Cincinnati, we quote as follows:

Southern coke, No. 1 foundry.....	\$16.25
Southern coke, No. 2 foundry.....	15.75
Southern coke, No. 3 foundry.....	\$15.00 to 15.25
Southern coke, No. 4 foundry.....	14.25 to 14.50
Southern coke, No. 1 soft.....	16.25
Southern coke, No. 2 soft.....	15.75
Southern coke, gray forge.....	14.00 to 14.25
Ohio silvery, 8 per cent. silicon.....	19.70
Lake Superior coke, No. 1.....	15.95 to 16.45
Lake Superior coke, No. 2.....	15.70 to 16.20
Lake Superior coke, No. 3.....	14.95 to 15.20
Standard Southern car wheel.....	22.25 to 23.25
Lake Superior car wheel.....	20.75 to 21.75

(By Mail.)

Coke.—Requisitioning on contract is keeping up well, and a few isolated deals dating from July 1 have been closed on the furnace product for a year's supply. Spot coke is weak in the furnace grades, but there are some nice little deals being closed between foundries and agents for the foundry product. The melt is increasing very perceptibly here. Connellsville and Wise County foundry brands are quotable on about the same basis—namely, \$2 to \$2.25; the former the spot price and the latter the contract. A little shading is still reported on some Pocahontas foundry grades at \$2.

Finished Material.—The upward trend was well maintained the closing days of June and the small part of July so far active in a business way. The local agencies representing the large interests now tied up in strikes do not anticipated any trouble in taking care of business on tin plate, sheets, &c. Dealers all testify to a stiffening tendency on the part of the mills and report deliveries from six to eight weeks behind. There is a good demand for all lines of finished material from stock, especially structural material, on the part of contractors and others who cannot wait on the mills. But few sources are open to the 1.25c., Pittsburgh, price on bars, according to dealers, and nothing less than 1.35c., Pittsburgh, is obtainable on structural shapes. There is but little demand for iron bars, on which the price is about 1.35c. to 1.40c., Pittsburgh.

Old Material.—Dealers are anticipating a heavy demand for melting steel within a few weeks. Not less than 100,000 tons are held and controlled by local interests, the greater part of which has been picked up during the months of depression and at attractive prices. Turnings are in good demand. Prices are unchanged. We quote dealers' prices, f.o.b. Cincinnati, as follows:

No. 1 R. R. wrought, net ton.....	\$14.00 to \$14.50
Cast borings, net ton.....	6.50 to 7.00
Heavy melting steel scrap, gross ton...	13.50 to 14.50
Steel turnings, net ton.....	9.00 to 9.50
No. 1 cast scrap, net ton.....	13.50 to 14.00
Burnt scrap, net ton.....	9.50 to 10.50
Old iron axes, net ton.....	17.50 to 18.00
Old iron rails, gross ton.....	15.00 to 15.50
Old steel rails, short, gross ton.....	13.50 to 14.00
Old steel rails, long, gross ton.....	13.50 to 14.00
Relaying rails, 56 lb. and up, gross ton.	21.50 to 22.00
Old car wheels, gross ton.....	14.50 to 15.00
Low phosphorus scrap, gross ton.....	13.50 to 14.00

Cleveland.

CLEVELAND, OHIO, July 6, 1909.

Iron Ore.—June shipments from the head of the lakes were 5,333,255 tons, making the season's total movement 8,702,323 tons. This is a big gain over last year, but a loss as compared with the two previous years. The ore movement is steadily improving and July shipments are expected to show considerable increase over June. One interest reports sales of non-Bessemer ore during the week aggregating 65,000 tons, and some small lots were sold by other ore firms. Although the strike on the lakes is still in force, it is not interfering with the lake trade, vesselmen being able to secure all the men they need to operate their boats. Prices at Lake Erie docks, per gross ton, are as follows: Old Range Bessemer, \$4.50; Mesaba Bessemer, \$4.25; Old Range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.50.

Pig Iron.—The local market shows some improvement

in the number of inquiries, although not much was sold during the week. Prices are firm and one or two interests that have been quoting the minimum prices have advanced their quotations. We note the sale of 900 tons of No. 2 foundry to a local consumer for last half at \$15.50, delivered, which appears to be the bottom price at present. Local furnaces are asking \$15.50 to \$15.75, delivered, Cleveland, and \$15 to \$15.25, at furnace, for outside shipment. In the Valley the price for No. 2 ranges from \$15 to \$15.25, at furnace, but some interests refuse to quote under \$15.50. Several local inquiries are pending for last half delivery, one for 1000 tons and others aggregating 2000 or 3000 tons. A stove manufacturer in Mansfield, Ohio, has an inquiry out for 500 tons each of Northern and Southern iron and among other inquiries is one from a northern Ohio implement maker for 500 tons for first half of 1910 delivery. Local interests report a fair volume of sales from furnaces in other districts, one having sold an aggregate of 3000 of foundry iron during the week for shipment from an Ohio furnace. We quote delivered, Cleveland, for the last half, as follows:

Bessemer	\$16.15 to \$16.40
Northern foundry, No. 1.....	16.00 to 16.25
Northern foundry, No. 2.....	15.50 to 15.75
Northern foundry, No. 3.....	15.00 to 15.25
Southern foundry, No. 2.....	16.35 to 16.85
Gray forge.....	14.50 to 15.00
Jackson County silvery, 8 per cent. silicon.....	20.05

Coke.—The market is quiet. One furnace interest contracted during the week for its requirements for the balance of the year, being about 8500 tons a month. There are some inquiries for foundry coke for the first half of next year, but producers expect better prices and are not inclined to sell that far ahead. We quote standard Connellsville furnace coke at \$1.60 to \$1.65 per net ton, at oven, for spot shipment, and \$1.70 to \$1.80 for the last half. Standard makes of 72-hr. foundry coke are held at \$1.90 to \$2 for spot shipment and \$2 to \$2.25 for the last half.

Finished Iron and Steel.—There has been some decrease in specifications since July 1, the rush to get in orders under low priced contracts which expired on that date having stimulated the demand during the latter part of June. The falling off has been scarcely as large as expected, and all the mill agencies report a fair volume of specifications since the beginning of the month. Prices are hardening up all around. The leading interest has advanced its price on plates and shapes to 1.35c., Pittsburgh, and the two local mills announce a similar advance on plates. Several of the mills are now firmly adhering to this price. While it might be shaded on a desirable order, some of the mills are asking a premium over the 1.35c. price for small lots. With the advance to 1.25c., Pittsburgh, by the leading interest for steel bars, this is now the minimum price that is being quoted by any of the mill agencies, and one independent producer has advanced its price to 1.30c., Pittsburgh. Inquiries are fairly plentiful for plates, shapes and steel bars for early delivery, a large portion of the inquiries being for material for specific work. Mills are disposed as far as possible to avoid making contracts for future delivery. The American Shipbuilding Company has closed a contract for building another lake boat, and it is understood that the contract for the plates and shapes, about 4000 tons, has been placed with the Carnegie Steel Company. This makes contracts for three boats that the shipbuilding company has secured in about two weeks and one or two other freighters are now being figured on. The demand for iron bars has fallen off, consumers having anticipated their wants before the shut-down. It is expected that at least one of the local bar iron mills will start up before the end of the month. We quote iron bars at 1.45c., Cleveland. The demand for structural material continues good, being all for small work and being furnished to fabricators by mills under contracts. The demand for sheets is fairly good and prices are firmer. A local mill announces an advance in prices of \$1 a ton. The demand for railroad spikes continues fairly good and prices are firmer. Prices on rivets are firmer and are now being well maintained. We quote steel structural and boiler rivets at 1.70c. and 1.80c., respectively, base, Cleveland.

Old Material.—With the local bar iron mills shut down and the steel mills only taking scrap on contract the market is very dull and not much improvement is expected before the end of the month. While prices are not firm they are holding up fairly well considering the absence of a demand, although in case of a forced sale a price concession would doubtless be necessary. The Erie Railroad will receive bids July 7 on an unnamed quantity of scrap, and the Baltimore & Ohio Railroad has a list out of 4000 tons for sale on July 12. Dealers' prices, per gross ton, f.o.b. Cleveland, are as follows:

Old steel rails.....	\$15.00 to \$15.50
Old iron rails.....	16.50 to 17.00
Steel car axes.....	19.00 to 19.50
Old car wheels.....	15.00 to 15.50
Heavy melting steel.....	14.00 to 14.50
Relaying rails, 50 lb. and over.....	21.50 to 22.50
Agricultural malleable.....	12.50 to 13.00
Railroad malleable.....	14.00 to 14.50
Light bundled sheet scrap.....	8.00 to 8.50

The following prices are per net ton, f.o.b. Cleveland:

Iron car axles.....	\$17.50 to \$18.00
Cast borings.....	6.50 to 7.00
Iron and steel turnings and drillings...	8.50 to 9.00
Steel axle turnings.....	10.00 to 10.50
No. 1 busheling.....	12.00 to 12.50
No. 1 railroad wrought.....	13.50 to 14.00
No. 1 cast.....	12.50 to 13.00
Stove plate.....	10.50 to 11.00
Bundled tin scrap.....	10.00 to 10.50

Pittsburgh.

PARK BUILDING, July 8, 1909.—(By Telegraph.)

Pig Iron.—The local pig iron market has been quiet in the past week as far as actual sales go, but there are several large inquiries out and prices are very firm. The American Radiator Company has bought about 25,000 tons of foundry iron from Eastern, Southern and Northern furnaces, while the International Harvester Company has been a heavy buyer of foundry iron for last half of the year delivery. The latter purchased about 10,000 tons of Southern No. 2 for third quarter delivery on the basis of \$12, Birmingham, and 1000 tons for last quarter at \$13, Birmingham. We quote standard Bessemer iron at \$15.25 to \$15.50; basic, \$15; Northern No. 2 foundry, \$15 to \$15.25; malleable Bessemer, \$15 to \$15.25, and gray forge, \$13.75, all at Valley furnace, carrying a freight rate of 90c. for delivery in the Pittsburgh District. The International Harvester Company is out with an inquiry for 5000 to 6000 tons of basic for last half of the year delivery, which may possibly go to Valley furnaces. We note a sale of 500 tons of Bessemer iron for July and August shipment at \$15.25, Valley furnace.

Steel.—There is a decided scarcity in the supply of open hearth billets and they are reported to have sold as high as \$25 a ton, f.o.b. Pittsburgh. Sheet and tin bars are \$25 minimum, and one leading producer will not entertain any propositions for bars under \$25.50 at mill. The shutdown of some of the tin and sheet mills of the American Sheet & Tin Plate Company will release some open hearth steel, but this is needed for rolling into finished material and will not affect the general market. We quote Bessemer billets at \$23, open hearth \$24 to \$25, and sheet and tin bars \$25 to \$25.50, f.o.b. Pittsburgh. A sale of 500 tons of 4 x 4 in. open hearth billets for prompt delivery is reported at \$25, Pittsburgh.

(By Mail.)

The strike in a considerable number of the mills of the American Sheet & Tin Plate Company will not affect that company's operations seriously, nor will the trade be put to much inconvenience for its usual supply of sheets and tin plates. This is the only unsatisfactory development in the steel trade, in which general conditions are most encouraging, actual orders and specifications received by the mills in June having shown an increase over May. It is not improbable that business will fall off a little this month, as it usually does in July and August, but the mills are well sold up and those not affected by wage scales expect to run practically full during the summer months. A good deal of tonnage in plates, bars and shapes that was sold several months ago at low prices, and for shipment prior to July 1, was not specified for and has been canceled. The average of prices, therefore, on nearly all lines of finished iron and steel, commencing with July, will no doubt be higher than for three or four preceding months. There is a decided scarcity in open hearth steel, and we are advised that open hearth billets have sold as high as \$25, Pittsburgh, for prompt shipment. Sheet and tin bars are very firm at \$25, with some concerns quoting 50c. a ton higher. The scrap trade has quieted down and prices are not as firm as they were. There is a little more inquiry for coke, but not much betterment in prices. One leading coke interest has withdrawn from the market as a seller of foundry coke for delivery over the balance of this year.

Ferromanganese.—The demand is quite active, several large lots being under negotiation for delivery in last half of this year and first half of next. We quote 80 per cent. foreign for prompt delivery at \$40.50 to \$41, seaboard, and for balance of the year at \$41.50 to \$42, seaboard, the freight to Pittsburgh being \$1.95 a ton. We note a sale of 75 tons for July and August delivery at about \$40.50, seaboard.

Ferrosilicon.—Premiums in prices for spot ferrosilicon are commencing to disappear, owing to the larger supply. We quote 50 per cent. at \$59 to \$61, c.i.f. Pittsburgh, equal to \$63 to \$64, under the present tariff of \$4 a ton. We note a sale of 50 tons at about \$62, delivered, Pittsburgh.

Rods.—Fair sized lots of Bessemer and open hearth rods are being sold at the regular price of \$29, Pittsburgh. Most consumers covered some time ago when rods were \$27 or lower and are specifying freely against these contracts. We quote Bessemer, open hearth and chain rods at \$29, Pittsburgh.

Muck Bar.—Although no new inquiries have come out,

the market is firm and we quote best grades of muck bar rolled from all pig iron at \$27, Pittsburgh.

Skelp.—Mills rolling grooved and sheared plate are pretty well filled up for the next month or two and buyers are specifying freely against contracts. Prices are firm and we quote grooved steel skelp at 1.30c., to 1.35c.; sheared, 1.40c. to 1.45c.; grooved iron, 1.50c. to 1.55c., and sheared iron skelp, 1.55c. to 1.60c., all for ordinary widths and gauges, f.o.b. Pittsburgh.

Steel Rails.—Last week the Carnegie Steel Company received new orders and specifications against contracts for about 5000 tons of standard section rails, the largest single order being for 1500 tons from the Flint & Pere Marquette; also booked orders and received specifications for 2000 tons of light rails. The company's Ohio Works at Youngstown has not been put on open hearth rails and probably will not. Some time ago the Steel Corporation received an order for 49,000 tons of open hearth rails from the Argentine Republic and it was once thought that these might be rolled at the Ohio Works. Plans have been changed, however, and they will likely be rolled by the Tennessee Company at Ensley, which is more in need of the tonnage than the Ohio Works. If these rails are not made at Ensley they will likely be turned out at the Edgar Thomson Works, to which the open hearth ingots will be shipped from Homestead or from some of the other open hearth plants of the Carnegie Company. We quote standard sections at \$28, at mill, and light rails are as follows: 12-lb., \$28; 16, 20 and 25 lb., \$27; 30 and 35 lb., \$26.75; 40 and 45 lb., \$26, all in 250-ton lots, f.o.b. Pittsburgh. Over 250 tons and up to 500 tons, 60c. a ton less, and over 500 tons \$1 a ton less. Splice bars are 1.50c., at mill.

Plates.—Some orders for cars have been placed and other active inquiries are pending. The Harriman lines have given out orders for 5200 freight cars, about equally divided between the American Car & Foundry Company, Pressed Steel Car Company and Standard Steel Car Company. The Alabama Great Northern has placed 500 steel cars with the Standard Steel Car Company, while the Baltimore & Ohio has asked bids on 3500 steel coal cars and 2100 box cars with steel underframes. The New York Central is in the market for 1000 steel cars, and several other roads are expected to send out active inquiries in a short time. The plates and shapes for all the cars booked by the Standard Steel Car Company and the Pressed Steel Car Company will be rolled by the Carnegie Steel Company, while the Jones & Laughlin Steel Company will furnish the plates and shapes for the cars booked by the American Car & Foundry Company. Some 12,000 to 14,000 additional tons of plates will be needed for the Brooklyn water works job, and inquiries are expected to be out in a short time. The leading plate mills are now operating to 90 per cent. or more of capacity and have a good deal of work ahead. Prices are firm, and we quote 1/4-in. and heavier plates at 1.30c. for desirable specifications and 1.35c., Pittsburgh, for small orders.

Structural Material.—The contract for the county bridge at Sewickley, Pa., over the Ohio River, about 4900 tons, has been taken by the Fort Pitt Bridge Works. Actual orders booked for structural steel in June were not quite as heavy as in May, but a good deal of work is pending, and inquiries are heavy. Prices on plain material are very firm, the minimum of the market on beams and channels up to 15-in. being 1.30c., at mill, and one or two leading sellers are holding for 1.35c., at mill. On small orders from 1.40c. to 1.45c. is quoted.

Bars.—A fair amount of new business is being placed in steel bars, but the mills are running mostly on specifications against contracts, which are coming in freely. The bar iron mills of the Republic Company closed down July 1, pending settlement of the wage scale, but its steel mills are running full. The demand for iron bars is getting heavier, and the market is firm. We quote steel bars at 1.25c., minimum, but most sellers are asking 1.30c. at mill, and are getting tonnage at this price. Iron bars are firm at 1.45c., at mill.

Tin Plate.—The independent tin plate mills that recognize the Amalgamated Association have signed for another year, commencing July 1, the same scale that was in force for the year ending June 30. Should the Amalgamated Association lose its strike against the American Sheet & Tin Plate Company and make any concessions in scale rates, it binds itself to give the same concessions to the independent mills. The demand for tin plate is showing a falling off, as the season is pretty well over, and this trade for the next three months will probably be quiet. Prices are firm on the basis of \$3.40 for 100-lb. coke plates, f.o.b. Pittsburgh.

Sheets.—The demand for black and galvanized sheets is steadily expanding, and this week the American Sheet & Tin Plate Company is operating close to 70 per cent. of its serviceable hot sheet mills in spite of the strike which started July 1. The only important sheet mill of the company affected by the strike is the Aetna-Standard Works at Bridgeport, which has 23 hot mills. The independent sheet mills have signed the old Amalgamated scale for another year from July 1, and will continue to operate steadily except for such shutdowns as may be necessary for repairs and inventory.

We quote one-pass box annealed black sheets, No. 28 gauge, at 2.20c., and No. 28, galvanized, at 3.25c., but these prices are being shaded on good orders. The regular price of painted roofing sheets, No. 28, is 1.55c. per square and of galvanized No. 28, is 2.80c. per square for 2½-in. corrugations, but these prices are also being shaded.

Hoops and Bands.—A fair amount of new orders is being placed and the tone of the market is firmer owing to the higher prices being quoted on Bessemer and open hearth billets. We quote steel hoops at 1.50c. and bands at 1.15c., steel card extras on the latter, but these prices are being shaded for desirable orders.

Shafting.—The demand for shafting is more active than for some time and prices are firmer. The usual discount of 60 per cent. off in carloads delivered in base territory is being shaded, 60 and 5 to 60 and 7½ more correctly representing the market in carloads and larger lots. On small lots 50 to 55 and 5 is being quoted.

Spelter.—The demand is fairly active, but is not as heavy as two or three weeks ago. We quote prime grades at 5.35c., East St. Louis, or 5.47½c., Pittsburgh, but on a firm offer and for large lots 5.30c., East St. Louis, might be done.

Spikes.—No large orders for railroad spikes have recently been placed, but the railroads are specifying liberally against contracts. Prices are firmer than for some time and we quote at \$1.65 to \$1.70 for 5½ x 9-16 in., and \$1.75 to \$1.80, base, for the smaller sizes, in carloads and larger lots, 5c. per keg additional being charged for less than carloads.

Merchant Pipe.—The National Tube Company is now making deliveries on 100 to 125 miles of 16-in. pipe, weighing 42 lb. to the foot, to the Lone Star Gas Company of Texas. This new gas line will extend from Petrolia to Fort Worth and Dallas, Texas, a distance of about 125 miles. Orders and specifications for pipe received by the mills in June showed an increase over May, but it is not improbable that the demand this month may show a slight falling off, as it usually does at this season of the year. Some very large projects in gas and oil lines are under way, but they are slow in development. Official discounts are being firmly held, these being 81 and 5 on black steel pipe, ¾ to 6 in., and 78 and 5 on black iron pipe, ¾ to 6 in., in carloads, and larger lots to the largest trade.

Boiler Tubes.—New orders show some little betterment, but the railroads are still buying in small lots and mostly for repair work. Regular discounts on both merchant and locomotive tubes, printed elsewhere in this issue, continue to be more or less shaded.

Iron and Steel Scrap.—The market has quieted down a good deal and prices are not as firm as they were, although not notably lower. Quite a few large consumers of scrap have closed down for inventory and repairs and will not take in material until they are about ready to start up again. Dealers quote heavy steel scrap for delivery at Follansbee, Sharon, Leechburg, Monessen, Steubenville and Pittsburgh at \$16 to \$16.25 per gross ton delivered. They quote cast iron borings at \$10, bundled sheet scrap \$14 to \$14.50 at consuming point, No. 1 cast scrap for foundry use at \$15 to \$15.25, No. 2 \$14.50, sheet bar crop ends \$17.50, No. 1 railroad malleable, \$14.75 to \$15, grate bars \$13, No. 1 busheling \$14 to \$14.25, No. 2 \$12 to \$12.25, low phosphorus melting stock 0.04 and under \$18.75 to \$19, rerolling rails \$16.50, old car wheels \$16.25 to \$16.50. Locomotive axles are \$25 to \$26 and locomotive tires \$18 minimum. Machine shop turnings are \$12 to \$12.25, rerolling rails \$18 to \$18.25, iron axles about \$24, steel axles \$19.50 to \$20 and stove plate \$11.75 to \$12. All above prices are per gross ton, f.o.b. cars, Pittsburgh, unless otherwise stated.

Coke.—Nothing has been heard recently of the proposed merger of a large number of coke plants in the Connells-ville and other regions, and the opinion is growing stronger that this whole scheme, which was never very favorably regarded, will fall through. The Jamison Coal & Coke Company announces that it has withdrawn from the market as a seller of foundry coke for delivery over the last half of the year, having 85 per cent. of its product under contract, and desiring to realize higher prices for what additional foundry coke it may have to sell. We note a sale of furnace coke for delivery over last half of the year at \$1.75, at oven, and for first half of next year at \$1.95, at oven. We quote standard makes of furnace coke for prompt shipment at \$1.60 per net ton at oven, and \$1.70 for delivery over last half of the year. Standard makes of 72-hr. foundry coke for spot shipment are held at \$1.80 to \$1.90 per net ton at oven, while on contract for shipment over last half of the year from \$2.10 and up to \$2.50 is being quoted. The output of coke in the Upper and Lower Connells-ville regions last week was 320,000 net tons, an increase over the previous week of about 10,000 net tons.

Crocker & Ketchum is a newly organized firm of engineers, making a specialty of steel construction, with office at 811 Seventeenth street, Denver, Colo.

Buffalo.

BUFFALO, N. Y., July 6, 1909.

Pig Iron.—The tone of the market is strong and sales for the week for prompt and early shipment have been surprisingly heavy, both in foundry grades and malleable, notwithstanding the holiday interruption, and some furnaces are refusing business of this character owing to being sold to capacity. Shipments on contracts are keeping up to a gratifyingly large aggregate. The furnace of the reorganized New York State Steel Company will be placed in operation on Saturday of this week, when all furnaces in the Buffalo District will be in full operation, with the exception of furnace B of the Buffalo Union Furnace Company, which, it is expected, will be put in blast in 10 days or two weeks, and two of the Lackawanna Steel Company's seven stacks, one of which is being relined, while the other is about ready to be placed in commission. Prices show an advancing tendency, especially for fourth quarter deliveries. We quote as follows for prompt and current quarter deliveries, f.o.b. Buffalo:

No. 1 X foundry.....	\$15.25 to \$15.75
No. 2 X foundry.....	15.00 to 15.25
No. 2 plain.....	14.75 to 15.00
No. 3 foundry.....	14.25 to 14.75
Gray forge.....	14.25 to 14.50
Malleable Bessemer.....	15.00 to 15.50
Basic.....	15.50 to 16.00
Charcoal.....	19.50 to 20.00

Finished Iron and Steel.—The leading interest has this week advanced its price for structural stapes and plates to 1.35c., Pittsburgh, and is quoting 1.25c. for bars, and the local agencies of both the Steel Corporation and independent interests report that orders for bars, plates and structural material continue in very satisfactory volume at the advanced rates. The agencies of the principal and independent interests also report that the month of June showed the largest aggregate tonnages booked in any month in their history. During the past week 5000 tons of structural and bridge material was placed in Canada by the leading interest. Several local contracts for structural steel were also closed, including 800 tons for the Granger & Co. warehouse, which went to the H. C. Harrower Iron & Steel Works, the steel to be furnished by the Carnegie Steel Company; 475 tons for the Buffalo Realty Company's building addition, taken by the Buffalo Structural Steel Company, and 500 tons for the McArthur Building, awarded to the Charles F. Ernst Sons Iron Works.

Old Material.—The market is dull and somewhat weaker, except in the case of iron axles, for which there is good request, with prices firm and higher, particularly for Lebanon and Pittsburgh deliveries. In other lines prices are softer, spot delivery lots being offered at a considerable reduction from last week's quotations. There is a buoyant feeling among dealers, however, as regards future business, and they are inclined to pay a little more for deferred deliveries, where these can be arranged with sellers, than for spot transactions. We quote as follows, per gross ton, f.o.b. Buffalo, prices being to some extent nominal:

Heavy melting steel scrap.....	\$14.75 to \$15.25
Low phosphorus steel scrap.....	18.50 to 19.00
No. 1 railroad wrought.....	15.50 to 16.00
No. 1 railroad and machinery cast scrap.....	14.75 to 15.25
Old steel axles.....	19.00 to 19.50
Old iron axles.....	21.25 to 22.00
Old car wheels.....	15.00 to 15.50
Railroad malleable.....	14.25 to 15.00
Boiler plate.....	12.75 to 13.25
Locomotive grate bars.....	12.00 to 12.25
Pipe.....	12.00 to 12.25
Wrought iron and soft steel turnings.....	9.00 to 9.50
Clean cast iron borings.....	7.50 to 8.00
No. 1 busheling scrap.....	13.00 to 13.50
No. 2 busheling scrap.....	11.00 to 11.50

The Arthur Koppel Company, Pittsburgh, has received orders for 500 all-steel mining cars, for the New River Coal Company, Glenjean, W. Va.; 400 mine cars for the New River & Pocahontas Consolidated Coal Company, Minden, W. Va.; 700 cars for the Pittsburgh-Buffalo Company, for the Marianna and other mines; 1500 ft. of portable track and a number of cars for contracting work at Danville, Va., and new all-steel equipment for the Casparis Stone Company's quarries at Columbus, Ohio.

The Independent Steel Company of America, Arthur Hirsch, manager, House Building, Pittsburgh, Pa., has awarded a contract to Taylor & Robinson, Huntington, W. Va., for the construction of buildings for a steel plant at Kenova, W. Va. The main structure is 120 x 605 ft.; the smallest is 60 x 70 ft., and there are eight other structures. The brick, lumber and other building materials have been purchased.

The Jones & Laughlin Steel Company, Pittsburgh, has placed a contract with the C. & G. Cooper Company, Mount Vernon, Ohio, for a 32 and 56 x 48 in. tandem compound Corliss engine to be installed in its works on the South Side. The engine will be of 2000 hp.

New York.

NEW YORK, July 7, 1909.

Pig Iron.—The holidays have somewhat curtailed the volume of business. Sellers are becoming firmer in their views and quotations are being marked up. The market is reaching the point at which one leading pig iron interest which has accumulated a very large stock of pig iron is marketing some of it in a very conservative manner. We quote \$17 to \$17.25 for No. 1 Northern foundry, \$16.50 to \$16.75 for No. 2 foundry, and \$15.75 to \$16 for No. 2 plain. Alabama iron is quoted at \$16.75 to \$17 for No. 1 foundry and \$16.25 to \$16.50 for No. 2 foundry.

Steel Rails.—The New Haven road's order for about 9000 tons of open hearth rails is expected to be placed this week and a considerable part will probably go to an Eastern mill. Eight thousand tons of 100-lb rails are called for, the balance being 80-lb. The Illinois Steel Company has booked about 15,000 tons for Western roads in the past week. Considerable requirements are still under discussion and the mills have been receiving specifications on orders closed one and two years ago which have not been counted as very "live" business.

Structural Material.—In the past week a fair business has been done, and the prospects for July are considered excellent. In New York City several good contracts have been let. Post & McCord have the Altman store addition, 3000 tons, and are low bidders on the Milbank Building, Twenty-fifth street and Fourth avenue, 3500 tons. The fabrication in both cases will be done by the American Bridge Company. The Hinkle Iron Works has the contract for a building at 203 West Twenty-fourth street, 2000 tons, and Ravitch Bros. will fabricate the steel for an apartment house at Riverside Drive and 156th street, 2300 tons. It may be some time before the steel is awarded for the two buildings, covering a block each, which the New York Central and New Haven roads will put up between Forty-sixth and Forty-eighth streets and Lexington avenue and Depew place. They will be 12 stories, and will be largely devoted to the one case to the Merchants' and Manufacturers' Exchange, and in the other to the New York Furniture Exchange. About 12,000 tons of steel will be needed. Railroad work is still under consideration, though no large amount has been placed recently. The Pennsylvania Steel Company has taken 1700 tons, chiefly for work on the Grand Trunk in Indiana. The Pennsylvania lines West will let 1500 tons additional for track elevation in the Chicago District, and the St. Louis & Southwestern and the Baltimore & Ohio are in the market for 2000 and 1800 tons, respectively. The records of the American Bridge Company show that 960,000 tons of steel work was bid on in the first half of the year, this company taking contracts for about 300,000 tons. In all it is estimated that 1,100,000 tons of structural steel work was bid on in the first half and nearly 800,000 tons was let. The bridge plants are getting into better shape steadily in their running schedules. The American Bridge Company has had an output of 1500 tons a day for some time, and may reach 2000 tons a day next month. While the largest contracts, such as the Sewickley, Pa., bridge, on which \$372,400 was the low bid for between 5500 and 6000 tons of steel, are going at low figures, the fabricating companies are following, in a measure, the advances made by the steel companies. We quote plain material, mill shipments, delivered at tidewater, at 1.41c. to 1.46c. for sizes up to 15 in.

Ferroalloys.—There continue to be heavy sales of ferromanganese. It is estimated that from 20,000 to 25,000 tons were sold last month. Prices have not gone up, however, and it is generally conceded that plenty can be had at \$42. A sale of 500 tons of ferrosilicon at about \$62, Pittsburgh, was reported during the week, and there seems to be a better supply on hand. Some sellers of imported ferrosilicon are looking for prices slightly above \$62, New York, but that figure is invariably quoted.

Old Material.—The market is quiet, with prices generally showing a softening tendency. Mills are evidently well supplied with stocks of old material, and requests for delayed shipment are more frequent, while rejections by over-critical consumers are becoming so numerous as to cause dealers much annoyance. Quotations are about as follows per gross ton for delivery in New York and vicinity:

Old girder and T-rails for melting.....	\$12.00 to \$12.50
Heavy melting steel scrap.....	12.00 to 12.50
Relaying rails.....	20.00 to 20.50
Standard hammered iron car axles.....	19.00 to 19.50
Old steel car axles.....	17.50 to 18.00
No. 1 railroad wrought.....	14.50 to 15.00
Iron track scrap.....	13.00 to 14.00
No. 1 yard wrought, long.....	13.50 to 14.00
No. 1 yard wrought, short.....	12.50 to 13.00
Light iron.....	8.00 to 8.50
Cast borings.....	8.25 to 8.75
Wrought turnings.....	9.50 to 10.00
Wrought pipe.....	12.00 to 12.50
Old car wheels.....	14.50 to 15.00
No. 1 heavy cast, broken up.....	13.00 to 13.50
Stove plate.....	11.50 to 12.00
Locomotive grate bars.....	10.50 to 11.00
Malleable cast.....	14.00 to 14.50

Bars.—Quotations on bar iron are continued at 1.45c.

to 1.50c., tidewater, and on steel bars at 1.41c. to 1.46c., tidewater. Business has naturally been light, owing to the holidays.

Cast Iron Pipe.—Transactions are few, with carload lots of 6 in. held at \$23.50 per net ton, tidewater.

Metal Market.

NEW YORK, July 7, 1909.

Copper.—A decidedly listless market sums up the copper situation. There is scarcely enough trading on which to base a definite price. Sellers have disposed of their holdings to such an extent that they are not over anxious to trade at the low figures generally quoted, and consumers seem to have satisfied their needs for the time being. The few transactions recorded have been for small lots, and all things considered, the situation is about the same as it was a week ago this time. The market is generally quoted at 13c. to 13.12½c. for electrolytic and 13.25c. for lake. If anything, prices are slightly weaker than they were a week ago and some isolated lots of electrolytic could be had for 13c., although the majority of those who quote that price have none to sell for immediate delivery. The exports of copper for June were the largest of any month in a year. They amounted to 33,399 tons. The London market to-day was firmer than it has been for a few days and was offered at £58 6s for spot and £59 2s 6d for futures. The production of copper continues to be very large, but the exports are taking care of a good deal of it and so far this month 5671 tons have been shipped abroad. It is notable that all the copper exported this month has been shipped either to Rotterdam or British ports and it is evident that most of it goes to warehouses.

Pig Tin.—For three successive weeks the only business to amount to anything worth mentioning in the pig tin trade has been done on a Friday, the sales of last Friday being fairly good. There is a decided absence of demand on the whole, and even taking into consideration the fact that a lull in business was expected with the finish of the buying movement inaugurated by the canning industries in the spring, the market in pig tin is a depressing one. The statistics for June were better than the trade in general anticipated, the deliveries during the month amounting to 3200 tons, and that created a decrease of 1000 tons in the visible supply as compared with the statistics of May 31. The prices established during the week were:

	Cents.
June 1.....	29.10
June 2.....	29.00
June 3.....	29.05
June 7.....	29.00

Regardless of the amount of trading done, the low price of the week was established on Friday, but this is accounted for by the fact that the London market was rather weak on that day, and sellers took into consideration the approaching holiday of Monday and were fearful that the market would not open particularly strong yesterday, which was the case. In London to-day spot tin was sold at £131 5s., and futures were sold at £132 12s. 6d., showing a very weak market. The arrivals of tin were 255 tons, and there are 2786 tons afloat.

Lead.—In London to-day the low price of the year was established for lead, it being £12 16s. 3d. Taking into consideration the duty, this would allow shippers to buy and ship here to sell at 4.31c., which is decidedly under the price asked by the American Smelting & Refining Company. The Western market is not particularly strong, and lead is quoted at St. Louis at 4.30c., although it is said that it might be bought for less in some quarters. The American Smelting & Refining Company is asking 4.35c., and outside interests quote from that price up to 4.40c.

Spelter.—Spelter is very quiet, and is generally quoted at 5.35c., with few transactions reported.

Antimony.—Antimony is weak and there is plenty to be had at the nominal prices, Cookson's at 8.25c. and Hallett's at 7.50c. The other brands are plentiful and can be had at 7c. or probably slightly lower.

Aluminum.—Electrical interests are buying aluminum rather freely and prices are firm at 24c. for No. 1 pure ingots and 34c. for sheets.

Tin Plate.—The situation in tin plate remains about the same, the demand being very light. There is plenty on hand. Prices are being well maintained. We quote for 100 I C coke plates \$3.64, New York.

Old Metals.—The following dealers' selling prices represent the New York market:

	Cents.
Copper, heavy and crucible.....	12.75 to 13.00
Copper, heavy and wire.....	12.50 to 12.75
Copper, light and bottoms.....	11.50 to 11.75
Brass, heavy.....	9.25 to 9.50
Brass, light.....	7.50 to 7.75
Heavy machine composition.....	11.75 to 12.00
Clean brass turnings.....	8.25 to 8.50
Composition turnings.....	9.75 to 10.25
Lead, heavy.....	4.20 to 4.25
Lead, tea.....	3.90 to 3.95
Zinc, scrap.....	3.75 to 4.00

Iron and Industrial Stocks.

NEW YORK, July 7, 1909.

The past week has been badly broken by holidays, as the stock exchanges were closed on both Saturday and Monday. Transactions were therefore limited in extent, but prices were devoid of special influences and values were generally maintained. The range of prices on active iron and industrial stocks on Thursday and Friday of last week and Tuesday of this week was as follows:

Allis-Chalm., com.	15 1/4	15 1/4	Pressed St., com.	43 1/2	44
Allis-Chalm., pref.	51 1/2	51 1/2	Pressed St., pref.	104 1/4	105
Beth. Steel, com.	30 1/2	31 1/2	Railway Spr., com.	43 1/2	44 1/2
Beth. Steel, pref.	61 1/2	61 1/2	Railway Spr., pref.	105	105 1/2
Can. com.	11 1/2	12 1/2	Republic, com.	31	31 1/2
Can. pref.	82	82 1/2	Republic, pref.	104 1/2	105
Car & Fdry, com.	57 1/2	57 1/2	Sloss, com.	83 1/2	83 1/2
Car & Fdry, pref.	117 1/2	117 1/2	U. S. Steel, com.	68 1/2	69 1/2
Steel Foundries.	48 1/4	49 1/4	U. S. Steel, pref.	125	126 1/2
Colorado Fuel.	43 1/4	44 1/4	Westinghouse Elec.	84 1/2	85 1/2
General Electric.	162 1/4	168	Cambria Steel.	41	41 1/2
Gr. N. ore cert.	75 1/2	76 1/2	Lake Sup. Corp.	21	24
Int. Harv., com.	84 1/2	85	Warwick		9
Int. Harv., pref.	121 1/2	121 1/2	Crucible St., com.	8 1/2	9 1/4
Locomotive, com.	60 1/4	60 1/4	Crucible St., pref.	72	73
Locomotive, pref.	118	118 1/4	Harb.-Walk. Ref., com.	20 1/2	
Nat. En. & St., com.	16 1/2	16 1/2	Harb.-Walk. Ref., pref.	85	
Nat. En. & St., pref.	89				

Last transactions up to 1.30 p.m. to-day are reported at the following prices: United States Steel common 68 1/2, preferred 125 1/2, bonds 106; Car & Foundry common 57 1/2, preferred 117 1/2; Locomotive common 60, preferred 118 1/4; Steel Foundries common 49; Colorado Fuel 44 1/4; Pressed Steel common 44, preferred 105; Railway Spring common 43 1/2; Republic common 31 1/4, preferred 104 1/2; Sloss-Sheffield common 83 1/2; Cast Iron Pipe common 30, preferred 82 1/4; Can common 11 1/2, preferred 82 1/2.

Iron and Steel Bonds.

Chisholm & Chapman, 18 Wall Street, New York, furnish the following quotations:

	Bid.	Asked.
Bethlehem Steel 1st ext. 5s, due January, 1926.	89	89 1/2
Bethlehem Steel purchase money 6s, August, 1998.	117	118 1/4
Buffalo Iron 5s, October, 1925.	95	100
Buffalo & Susquehanna Iron 1st 5s, June, 1932.	99 1/2	
Buffalo & Susquehanna Iron deb. 5s, January, 1926.	94	98
Dominion Iron & Steel 5s, July, 1929.	93 1/2	
La Belle Iron Works 1st 6s, December, 1923.	104	105
Lackawanna Steel 1st 5s, April, 1923.		98
Maryland Steel 1st 5s, February, 1922.	102	103 1/2
Penn Steel 1st 5s, November, 1917.	102	103 1/2
Pennsylvania & Maryland Steel 6s, September, 1925.	108	110 1/2
Republic Iron & Steel 1st 5s, October, 1934.	101	101 1/2
Sloss Iron & Steel 1st 6s, February, 1920.	107	108 1/2
Sloss Iron & Steel consol. 4 1/2s, April, 1918.	94 1/2	96 1/2
Jones & Laughlin 1st 5s, May, 1939.	100 1/2	100 7/8

United States Steel Corporation.

Collateral Trust 5s, Series A, C, E, April, 1951.	114 1/2	115 1/2
Collateral Trust 5s, Series B, D, F, April, 1951.	114 1/2	115 1/2
Sinking Fund 5s, April, 1963.	105 1/2	106
Union Steel 1st 5s, December, 1952.	105 1/2	105 7/8
Clairton Steel 5s, 1908-1913.	100	
St. Clair Furnace 1st 5s, 1910-1939.	100	
St. Clair Steel 1st 5s, 1908-1926.	100	
Illinois Steel deb. 5s, January, 1910.	100 1/2	
Illinois Steel 5s, April, 1913.	100 1/2	

All bonds quoted "and interest."

Dividends.—The Vulcan Detinning Company has declared the regular quarterly dividend of 1 1/4 per cent. on the preferred stock, payable July 20.

The Pittsburgh Malleable Iron Company, Pittsburgh, Pa., has declared a quarterly dividend of 2 1/2 per cent., payable July 20.

The Harbison Walker Refractories Company, Pittsburgh, Pa., has declared a quarterly dividend of 1 1/2 per cent. on the preferred stock.

Canada's Bounty Showing in 1908-9.

TORONTO, July 3, 1909.—In the fiscal year ending March 31 there was paid out on bounty account a total sum of \$2,467,305, as compared with \$2,787,350 in the fiscal year 1907-8. Under their several heads the payments for the two years compare as follows:

	1908-9.	1907-8.
Pig iron.	\$693,423	\$863,816
Steel.	838,100	1,092,200
Wire rods.	333,090	347,134
Lead.	307,433	51,001
Crude petroleum.	260,698	391,216
Manila fiber.	34,561	41,983

The bounties on iron and steel were at lower rates in the former of the two years under review, and on lead the rate was higher in the latter year. On crude petroleum and on manila fiber the rates were the same for both years. The fiscal year and the steel bounty year do not coincide, the former ending on March 31 and the latter with the calendar year. During part of the last fiscal year the bounties were \$2.10, \$1.10 and \$1.65 per ton on pig iron made from native ore, or pig iron made from imported ore, and on steel respectively. During the re-

mainder of the last fiscal year the rates were respectively \$1.70, 70 cents and \$1.05 per ton, at which they are to continue until next January.

But the falling off in total outlay on bounty account is not all to be credited to the declension in the rates on iron and steel. There was a shrinkage in production, which, however, in its turn may have been partially due to the waning of Government assistance. Of course, what that shrinkage mainly reflected was a contraction in the demand, which affected the iron and steel trade in the twelvemonth covered even more than some other lines of business. It is possible that if the bounties had remained at their high limit some of the iron and steel manufacturers might have increased their output even at the risk of accumulating stocks.

In the last fiscal year the production of pig iron amounted to 609,431 tons, as against 683,779 tons in the fiscal year 1907-8. The quantity of Canadian ore used in this product was 179,735 tons, as against 213,513 tons in 1907-8. Of foreign ore 1,037,585 tons were used, as against 1,168,806 tons in 1907-8. The output of steel was 570,588 tons, as against 661,939 tons in 1907-8.

C. A. C. J.

Labor Notes.

The International Association of Machinists is making demands for a contract in the East. It asks for a minimum wage of \$3.25 per 9-hr. day for machinists and \$4 per day for tool makers and die makers; one apprentice for the shop and one for each five journeymen; that all workmen employed shall be members in good standing of the International Association of Machinists, and that the employer when in need of men shall notify the shop committee or the office of the International Association of Machinists, and shall notify by mail or telephone such shop committee or office at least 24 hr. before the new men start to work. The demands will be ignored by employers who are members of the National Metal Trades Association, as their shops are being operated on the open basis.

The shops of the Pennsylvania Railroad at Verona, Pa., near Pittsburgh, began to work 10 hr. a day July 1, instead of 8 hr., as had been the case for several months. The shops will operate 5 hr. on Saturdays. It had been two years since these shops were operated full time.

Employees of the Light Inspection Car Company, Hagerstown, Ind., received in their pay envelopes, June 19, \$30 to \$50 each more than usual. The excess represented the difference between the wages they have received since the reduction last fall and what they had previously received. With the improvement in business in the spring the former wages were restored, and the company recently decided to go further and give back the amount of the reduction which the men had readily accepted last year rather than have the plant close for a time.

The Reading Iron Company posted notices June 29 that part of the reduction in wages made last February would be restored beginning July 5. It is understood that puddlers will be advanced from \$3.75 to \$4 per ton and all others in proportion.

The Pennsylvania Steel Company and the Maryland Steel Company on July 1 restored the wages of their employees to the rates in effect prior to April 1.

All employees of the Sharon Steel Hoop Company, Sharon, Pa., received a 10 per cent. increase in wages, effective July 1.

The new puddling plant and skelp mills of A. M. Byers & Co. at Girard, Ohio, have been started up to nearly full operation with nonunion men. A strike has been on at this plant for some time, caused by the refusal of the firm to sign the Amalgamated scale.

Another Great Addition to Gary.—There is every reason to state that the report is true that the United States Steel Corporation has authorized the building of enormous sheet and tin plate mills at Gary, Ind. The plans provide for 50 sheet mills and 50 tin plate mills.

The Sheet and Tin Plate Situation.

The Strike in the American Company's Mills.

On June 30 those of the sheet and tin plate mills of the American Sheet & Tin Plate Company for which the Amalgamated scale was formerly signed closed down on account of the refusal of the men to continue at work on the open shop basis, and the Amalgamated Association has declared a strike on at these mills. The single exception was the Guernsey Works at Cambridge, Ohio, which was classed as a union mill, but the men employed there refused to stop work, and the plant, which contains 11 hot sheet mills, is running full. The Aetna-Standard Works at Bridgeport, Ohio, having 23 hot mills, is the largest union mill which is closed down, and only about 40 hot sheet mills embraced at Aetna-Standard, Midland, Piqua and Struthers are idle. On the other hand, the company is operating in full the following sheet plants: Canal Dover, 11 hot mills; Canton, 5; Dresden, 4; Mercer, 5; New Philadelphia, 12; Old Meadow, 8; Scottsdale, 9; Vandergrift unit, 58; Wellsville, 10; Woods, at McKeesport, 13, or a total of 146 sheet mills that are operating on the open shop basis, against a total of only 40 hot sheet mills that are shut down. It will be seen, therefore, that the company will be affected very little by the strike as far as its sheet mill operations are concerned.

The company has 8 tin plate plants closed down, having a total of 142 hot mills, while there are 9 tin plate plants running with a total of 90 hot mills. The largest tin mills that are closed are as follows: American at Ellwood, 28 hot mills; Laughlin at Wheeling, 23; New Castle, 20; Shenango, 30. It is the intention of the company to start up the New Castle and Shenango mills at New Castle, which have a total of 50 hot tin mills, at an early date, arrangements being now under way to put them in operation. The demand for tin plate has fallen off very much, as it always does at this season of the year, and as the company has large stocks ahead it will not be seriously embarrassed in this department even should the strike last over the next two months, which is not likely.

The Independent Mills Sign the Scale.

At a conference held in Pittsburgh on June 29 and 30 between the Amalgamated Association and the independent sheet and tin plate manufacturers an agreement was reached which provided that the Amalgamated wage scales for sheet and tin mills which expired on June 30 shall be in effect for one year from July 1. The Amalgamated Association had added some footnotes in the tin plate scale for the year beginning July 1 to which the manufacturers objected and which were eliminated. It was agreed, however, that should the Amalgamated Association lose its strike in the mills of the American Sheet & Tin Plate Company any concessions that may be made in scale rates in these mills would be given to the independent manufacturers. The possibility of the Amalgamated Association winning this strike is very remote. The independent sheet and tin plate mills that signed the scale at the conference last week are as follows:

Atlanta Sheet & Tin Plate Company, Atlanta, Ind.; American Rolling Mills Company, Middletown, Ohio; Globe Rolling Mills Company, Newport, Ky.; National Enameling & Stamping Company, St. Louis; Empire Iron & Steel Company, Niles, Ohio; Thomas Steel & Sheet Company, Niles, Ohio; Youngstown Sheet & Roofing Company, Youngstown, Ohio; Whitaker-Glessner Company, Wheeling and Martins Ferry, W. Va.; N. & G. Taylor Company, Cumberland, Md.; Zug Iron & Steel Company, Pittsburgh; Pope Tin Plate Company, Steubenville, Ohio; Follansbee Brothers Company, Pittsburgh, and Carnahan Tin Plate Company, Canton, Ohio.

The Pennsylvania Malleable Iron Company, Pittsburgh, with works at McKees Rocks, Pa., has leased its plant to the Pressed Steel Car Company, which will operate it in the future.

OBITUARY.

A. BRADSHAW HOLMES, secretary and treasurer of the Independent Pneumatic Tool Company and Aurora Automatic Machinery Company, Chicago, died June 30 from injuries sustained by falling from the piazza of his hotel. He was well known in the pneumatic tool business, having been connected with the Standard Pneumatic Tool Company and the Rand Drill Company for a number of years prior to his connection with the Independent Pneumatic Tool Company, of which corporation he was secretary and treasurer from its organization. He was a man of exceptional business ability.

THOMAS MIZNER, once prominent in the stove trade, died in Detroit, Mich., June 25, aged 78 years. He was born in Geneva, N. Y., and in early life was a lawyer. He was one of the organizers of an important Western stove company, but was unfortunate in his investments and died poor.

ALBERT G. SOUTHER, president of the E. E. Souther Iron Company, St. Louis, Mo., died June 26 on a steamboat en route from Chicago to Mackinac. He had been in ill health for some time.

SAMUEL F. LUTY, a well known journalist of Pittsburgh, died July 5. He was born in Allegheny in 1860 and was educated in the Fifth Ward School and the Western University. For some years he was labor editor on a number of the Pittsburgh newspapers and early in 1906 was appointed associate editor of the *Industrial World* at Pittsburgh, a position which he occupied at the time of his death.

JEROME KEELEY, of Jerome Keeley & Co., Philadelphia, died July 3 after an illness of several years. He was born January 9, 1844, at Phoenixville, Pa. His father was a constructing engineer and superintendent of blast furnaces. After working for several years under his father in the works of the Phoenix Iron Company, he entered the Polytechnic College, Philadelphia, and was graduated in June, 1862, as mechanical and metallurgical engineer. He then engaged as superintendent of the blast furnaces of the Phoenix Iron Company. In 1869 he established an office in Philadelphia as consulting engineer in metallurgy and mining and to handle iron and steel products, and was also engaged in the manufacture of pig iron, blooms, bars, &c., and later added the coal and coke business. In 1895 he was elected director and vice-president of the Sheffield Coal, Iron & Steel Company of Sheffield, Ala., but later withdrew entirely from the company. Until overtaken by ill health he was president of the Durham Iron Company, and for many years was a director in the Tradesmen's National Bank. He was a member of the Union League and of the American Institute of Mining Engineers.

The Pittsburgh-Buffalo Company, Pittsburgh, a large miner and shipper of coal, has placed an order for 1900 4-ton mine cars, distributed as follows: Standard Car Mfg. Company, 500; Youngstown Car Mfg. Company, 200; Connellsville Iron Works, 100; Ohio Ceramic Company, Cleveland, 100; Arthur Koppel Company, Pittsburgh, 100. The 100-car order of the Arthur Koppel Company makes a total of 700 cars to be furnished by that concern, orders having previously been placed for 600. All these cars will be used in the Marianna mines of the Pittsburgh-Buffalo Company in Washington County, Pa. The same company will also shortly place contracts for a new steel tippie for Marianna to have a capacity of 10,000 tons of coal per day; also for 190 coke ovens and for 200 dwelling houses.

The Pittsburgh, Buffalo & Rochester Railroad has placed an order with the American Locomotive Company for 15 heavy freight locomotives, which will probably be built at its shops at Dunkirk, N. Y.

The Connellsville Iron Works, Connellsville, Pa., has been appointed selling agent in that district for the Westinghouse Electric & Mfg. Company.

The Machinery Trade.

NEW YORK, July 7, 1909.

A fair volume of business was transacted the past week, notwithstanding the fact that business houses were open only half the week and heads of departments were away in many instances a longer period. With every one taking advantage of the short vacation the receipt of no large inquiries or orders was not disappointing. Since our last report additional information has come to hand concerning the various automobile enterprises projected in this territory and a marked expansion in this industry is expected in the near future. For some time builders of automobiles were the mainstay of the market, buying quite liberally when other branches of trade were doing practically nothing, and while orders from that source have not been so plentiful in the last few weeks it is expected that a great deal of new business will be placed shortly. Several of the important builders have under consideration the purchase of new equipment, and representatives of the Fiat Automobile Company have been investigating the merits of the various makes of machines that will likely be required for equipping the large plant to be erected near New York.

The Maxwell-Briscoe Company, Tarrytown, N. Y., which recently acquired a plant at Auburn, R. I., intends to move its Pawtucket and Atherton plants, which are now located in leased buildings, to Auburn, where it will later extend the work so as to make the new shop more of a manufacturing plant than was possible at either Pawtucket or Atherton, both of which are used mainly for assembling. While the company does not expect to do much this season in the way of purchasing new machinery, it will during the season make considerable additions to the equipment of the Auburn plant so that it may be a fairly complete shop and able to handle its own requirements for 1911. Most of the machinery required for equipping the plant at Tarrytown, recently purchased from the Ingersoll-Rand Company, was purchased some months ago, consisting principally of heavy presses for stamping out frame channels, body panels and other heavy sheet metal work, and in addition a complete woodworking equipment was installed which had previously been purchased. Since January 1 the company has purchased \$185,000 worth of additional machine tools for its 1910 production, \$105,000 of which went to New Castle, Ind., \$73,000 to Tarrytown and \$7000 to Rhode Island.

A plant for the manufacture of automobiles is to be erected on Webster avenue, between Second and Third avenues, Long Island City, by the Palmer & Singer Mfg. Company, New York, which, we understand, will consist of several buildings. The plant will be used principally for assembling purposes, but it is likely that considerable new machinery will have to be purchased for equipping it. The main building will be three stories high, with concrete floors, and will be practically fireproof.

The new plant to be erected at Long Island City by Brewster & Co., New York, will be about 200 x 345 ft., six stories. While the machinery in its present factory in New York will probably be moved into the new structure when completed, it is likely that quite a few additional machines will be required.

The Lozier Motor Company, Plattsburg, N. Y., which recently placed in operation extensive additions to its plant, intends to build another addition to its new machine shop annex, also an extension to the rough storehouse. Contracts for the additions have been placed and the machinery has been bought.

At a hearing last week before the Public Service Commission it developed that the New York Central Railroad plans to spend several million dollars this year in making important improvements to its system, including the electrification of its lines in New York and vicinity, electrification of the West Shore Railroad between Syracuse and Utica, and for new trackage and stations and the purchase of additional equipment.

The United States Circuit Court at Atlanta, Ga., has authorized Henry M. Atkinson and Samuel F. Parrott, receivers of the Atlanta, Birmingham & Atlantic Railroad, to issue \$3,250,000 of receivership certificates to complete the line to Birmingham and for improvements. On the Brunswick division it is proposed to spend \$130,734 for passenger stations, tracks, yards, connections, building coal stations, &c., and it is necessary to spend \$265,862 on that part of the Birmingham division already operated for various construction work, including shops, coaling stations, interlocking plant, &c.

The new plant to be erected at Oil City, Pa., by the American Railway Appliance Company, recently organized with a capital stock of \$1,000,000, will at the beginning consist of a building 50 x 150 ft., with a wing 20 x 100 ft. The company purchased several acres of land on the Penn-

sylvania Railroad for its new plant, and it is likely that eventually the initial capacity will be considerably increased. The company will manufacture several inventions of Louis E. Keller, for many years superintendent of the blacksmith department of the Pennsylvania Railroad at Oil City, the first to be a keystone anchor for use on oil tank cars, an appliance that binds the tank to the steel center sills. Steel tank cars will also be built, for which it is understood sufficient orders have been received from the local refiners to keep the plant busy for some time. As soon as manufacturing is well under way, interchangeable crossings and frogs, combination steel ties, rail braces and other specialties will be taken up. Fred A. Steck is president; Louis E. Keller, vice-president; Thomas J. Riggs, secretary and treasurer.

The Frevert Machinery Company, New York, has received an order for the complete machinery equipment for the new automobile plant to be established by the Washington Motor Vehicle Company, Washington, D. C.

Morris Knowles, consulting engineer, Pittsburgh, Pa., expects to have plans and specifications ready in about a month for the new water works system at Parkersburg, W. Va., the equipment to include two 3,500,000-gal. pumps, three boilers and 2000 cu. ft. air compressors. About 14 wells will be drilled and water from each will be piped to a cistern and from there pumped to a small reservoir and then into a large reservoir on Terrapin Knob.

The Board of Water Supply, New York, will receive bids until July 20 for contract No. 39, for furnishing and installing two 12,500,000-gal. steam turbine pumps, two 225-hp. water tube boilers and accessories at the Jerome avenue pumping station in the Bronx. In this connection it is interesting to note that the high pressure water service for fire protection in Brooklyn is to be considerably increased, and it is likely that additional equipment will be required for this work. On July 3 the Board of Estimate voted \$623,356 for the installation of additional high pressure water service in that borough. The Board of Water Supply will receive bids until July 14 for furnishing and installing direct connected electrical driven vertical pumping units with appurtenances in the pumping station to be erected for the sewage disposal plant at Mt. Kisco, N. Y.

The Water Works Commission of Chattanooga, Tenn., has been authorized to issue \$900,000 in bonds for the construction of a municipal water works. It is probable that an engineer will be engaged to draw up plans and specifications for the new plant, and after these are completed bids for the work and equipment will likely be asked.

The city of Toronto, Ont., will shortly ask bids for two 1500-hp. induction motors, direct connected to turbine pumps; four 1500-hp. synchronous motors with turbine pumps, four 500-hp. synchronous motors with turbine pumps, two 500-hp. induction motors with turbine pumps, two 300-hp. induction motors with turbine pumps, two 225-hp. synchronous motors with turbine pumps, together with valves, piping, bed plates, couplings, connecting material, &c. For information application should be made to the City Engineer's Department, Toronto.

Chicago Machinery Market.

CHICAGO, ILL., July 6, 1909.

Trade for the month of June, according to the reports of the leading machinery houses, averaged better than was at first expected. This was due to a more active demand, which developed toward the latter part of the month when sales were considerably increased by the placing of several good sized orders. Yet notwithstanding this belated improvement sales for the month fell short of those for May, though not to the extent that was at first anticipated. Although the inquiries for the past week included no requirements of exceptional size, they were fairly numerous, and were of a character that indicated a more diversified demand. The leading automobile builders are believed to have purchased their equipment for such extensions as are to be completed this year, but there are a good many new plants connected with this industry starting up here and there from which orders are being received. New garages are springing up all over the country, and while their individual requirements are small, they are in the aggregate becoming an important factor in the machine tool trade. A new field is thus being opened up, and developments in this direction are being closely watched by machinery dealers who realize it is well worth cultivating. Reports from a number of Western tool makers show a marked improvement in shop activity, and bespeak confidence in the continued expansion of business. No new railroad orders have appeared in the market, with the exception of an occasional one here and there for a single tool, but in view of the fuller employment of railroad and outside car shops, the trade is hopeful that the market will receive more substantial support from this source in the near future.

The Iowa Central Railway Company is enlarging the

machine side of its erecting shop at Marshalltown, Iowa, by an addition, 22 x 160 ft. The machine tool equipment for this addition includes one 85-in. driving tire lathe, one 2 1/2 x 26 in. universal turret lathe, two 42-in. boring and turning mill, one 30-in. engine lathe, two 42-in. crank shapers, one double headed axle lathe, all of which have been purchased.

The Vanguard Mfg. Company, Joliet, Ill., maker of high grade automobile accessories, whose business has outgrown its present quarters, has secured a new site, and is now building a factory, 60 x 250 ft., of brick and concrete. Upon completion of this improvement the working force will be at least doubled, and a newly patented automobile wind shield will be added to the line. The company has recently purchased several new machine tools, and some additional equipment will doubtless be required to complete the equipment of the new plant, but this will be a matter for later consideration.

Next to milling machines grinding machinery has perhaps been more active than almost any other line of machine tool equipment. As an indication of present conditions, the Wilmarth & Mormon Company, Grand Rapids, Mich., states that the month of May not only produced by far the largest volume of business in any other like period within a year and a half, but with a single exception was the largest month in the history of the business; and June closed but little short of this record. The company is running a number of its machines with day and night shift, and plans are being made for the overhauling of its machine room with a view to providing additional facilities. Several new tools now in the course of development will be brought out shortly.

The Southwestern Iron & Steel Company, Gainesville, Texas, recently incorporated to succeed the Gainesville Iron Works, of that place, is preparing to enlarge the plant by the installation of new engines, boilers and new smelting cupola. The company will also install woodworking machinery for the manufacture of wooden wind mills.

Plans now in course of preparation for extensions and improvements to the municipal electric light plant and water works system at Siloam Springs, Ark., will be completed about August 1, when bids for the necessary machinery equipment will be invited. The work contemplated calls for an expenditure of about \$30,000. Geo. De Spain is secretary of electric lighting service.

The Kable Brothers Company, Mount Morris, Ill., has acquired the plant and holdings of the Mount Morris Electric Company, which will establish a 24-hr. service for which the installation of a new dynamo will be required.

The El Paso (Texas) branch office and warerooms of the Sullivan Machinery Company, Chicago, have been moved from 206 St. Louis street to 506-508 San Francisco street, where Sullivan air compressors, diamond drills, rock drills and other mining machinery are carried in stock.

The agency in the Chicago territory for the automatic gear generator, made by Alfred H. Schuette, Cologne-on-Rhine, Germany, has been secured by the A. D. White Machinery Company, Chicago. This tool is made in three sizes, cutting gears from 20 to 50 in. in diameter and from 7 to 13 in. face.

Philadelphia Machinery Market.

PHILADELPHIA, PA., July 6, 1909.

Business has been largely suspended during the week, owing to the national holiday. Manufacturers and merchants have in many instances observed a three-day cessation from business, while numerous plants will be idle for a longer period to facilitate the usual midsummer repairs, semiannual stock taking, &c. The rather quiet conditions, therefore, are not unusual but expected. While it is rather early as yet for definite information as to the volume of business transacted by merchants and manufacturers in the past month, the aggregate is estimated as being nearly as large as for May. Quite a fair volume of business is before the trade, although there are but few inquiries of any large size, the demand being largely of a day to day character. Propositions under consideration close rather slowly, there being no disposition to hurry on the part of prospective purchasers.

Railroad buying is very quiet as far as machine tools are concerned, although it is understood that shop equipment in some instances is being inspected in view of possible needed equipment. The foreign demand shows no forward movement, a few scattered inquiries being reported for equipment of a special nature. The demand for second-hand tools drags, reflecting the general condition of the trade at this season. Some considerable boiler and engine business is pending, in instances covering quite fair sized installations, and while bids have been received and awards decided upon in some cases, no announcements regarding them have been made.

The foundry trade is fairly well engaged, when the conditions of the trade generally, as well as the season of the year, are taken into consideration. The demand, however,

is still irregular in some lines, and on the whole will bear considerable betterment.

The City Councils of Camden, N. J., again deferred action, at a meeting held June 30, on the ordinance granting certain privileges, rights of way, &c., to the Camden Tunnel Railroad Company, in connection with its proposed tunnel under the Delaware River connecting the cities of Philadelphia and Camden. The ordinance, which is to be considered July 22, stipulates that work must be started within one year and be completed five years from date of the commencement of operations.

Haney, White & Co., manufacturers of mill work for buildings, &c., have purchased property at Broad and Somerset streets, measuring 100 x 375 ft., extending to the Philadelphia & Reading Railway. It is understood that they propose to erect a large manufacturing and warehouse building on the site.

The Espen-Lucas Machine Works reports a fair run of business for its general line of machine tools, coming largely from industrial plants, automobile manufacturers and foundries. Deliveries recently included cold saw cutting-off machines, boring mills, milling machines and saw grinders to customers in different sections of the country. The outlook for new business is believed to be favorable, although no large increase is anticipated during the summer months.

A five-story light manufacturing building, 38 x 91 ft., is to be erected at the southwest corner of Eleventh and Winter streets for G. W. F. Sulzer. The building is to be of brick and concrete from plans by Herman Miller.

Operations have been started on the new power house to be erected in connection with the new building of the Curtis Publishing Company in Sansom street, west of Sixth street. The plans are by Frank C. Roberts & Co. and Edgar V. Sellar. The power equipment, bids for which have been in hand for some time, has been decided upon, but formal awards have not yet been made, the names of the successful bidders being withheld.

The Newton Machine Tool Works, Inc., reports an increased volume of business, coming largely from industrial plants. Orders recently have principally consisted of milling machines and cold saw cutting-off machines. The outlook is considered good, although no heavy outturn of orders is expected during the current month.

Cincinnati Machinery Market.

CINCINNATI, OHIO, July 6, 1909.

With but a half week of normal business activity to base the review of the week upon and an unusually protracted period of midsummer holiday, the estimate might reasonably be discounted somewhat perhaps; yet the three days gave such excellent promise that the general feeling in machinery circles is optimistic. In the tool line shapers have again forged to the front and all manufacturers in this district have had some business. Drills are gaining also. One large manufacturer has made preparations for the immediate building of eighty representing different types. The correspondence from Europe is also a little more encouraging, and it is believed there will be some good business from the other side before fall sets in. All manufacturers and dealers in tools are watching for the expected announcement from the Delaware, Lackawanna & Western, and with the advent of the new fiscal year a number of other railroads are expected to buy at least a part of the tools needed for extensive repair work in their shops. As a rule all the larger tool manufacturers in this district are running on full time, 55 hr., and employing from two-thirds to a four-fifths normal force. In a few instances shops are operating with a normal force—i. e., equal to that on the pay roll in 1906. This is true of one of the largest shops here making four or five tools. A distinct improvement is seen in the foundry districts within the past two weeks. Some of these are running five and six heats per week of from 8 to 12 tons each. All the jobbing foundries are looking forward to a busy summer and a busier fall and winter, and are preparing accordingly.

Dealers report, as a rule, excellent business for the closing days of June and the first three of July. A considerable share of this goes to the South, which seems to be improving at a more rapid pace than the Middle West and Northwest.

The adjustment of the wage scale at the rolling mills of the Central West has found much favor here, as the Newport Rolling Mills and allied interests across the river are a great factor in the local manufacturing iron and steel trade.

Manufacturing interests of Fort Wayne, Ind., are pleased with the success of the Menefee Foundry Company, which has grown from a humble beginning in 1891, with C. M. Menefee at the head, to the large establishment now completed at 2321-2337 Oliver street in that city. The new foundry building recently erected is rapidly getting into normal activity. An addition was also recently made to the brass department.

The Hocking Valley Railroad has made preparations at

its shops at Logan, Ohio, for the building of 75 new freight cars, the first to be built at these shops.

As a means of economy the repair department of the Western Motor Works at Logansport, Ind., has installed a welding machine for aluminum. Formerly the aluminum engine cases sent to the factory for repairs had to be replaced.

The Springfield, Light, Heat & Power Company, Springfield, Ohio, has let a contract for a 300-kw. and a 200-kw. generator to replace the old ones in use at the plant, and will also later let other contracts for the erection of a new power house to be erected on Buck Creek in that city.

The Practical Conveyor Company is a new corporation at Anderson, Ind., which is to manufacture ensilage conveyors, farming machinery, implements and appliances. M. Swain is at the head of the company.

The Ft. Wayne (Ind.) Refrigerator Works is adding men constantly and working full time on some large contracts.

Work is to be commenced at once on 10 new steel bridges to be built in the southern part of Indiana for the Monon Railroad. The steel will be furnished by the Stroebel Steel Construction Company of Chicago.

The Ajax Wrench Company, Toledo, Ohio, has been incorporated by William Harrop, Frank Gorman, M. S. Smith, George E. Lynn and Robert B. Wilson. The product, which is soon to be placed on the market, is a patent wrench.

Milwaukee Machinery Market.

MILWAUKEE, WIS., July 6, 1909.

Representatives of manufacturers and supply houses returning from the recent railroad convention at Atlantic City are enthusiastic over the prospects for future business. Railroad men with whom they talked were almost unanimous in encouraging the belief that betterments of considerable magnitude will be entered upon before fall, attention being particularly called to the fact that the fiscal year of many companies closes June 30 and that, in order to make as good a showing as possible for the 12 months, the majority have been holding off until this time before incurring any liabilities not absolutely necessary to the maintenance and operation of their properties. Among the steam and electric traction lines in this section there are indications of great activity ahead; in fact, work upon improvements of various kinds is already being pushed and the aggregate of orders for equipment and material has begun to assume large proportions, notwithstanding the fact that these have thus far covered only the requirements of the immediate future and comprise mostly small lots intended to "piece out" with. Unquestionably they will be followed by contracts more fully representative of the present situation and its necessities.

A feature of much local interest is the completion at West Allis, for the Industrial Works, Bay City, Mich., of the first of a considerable number of low pressure Parsons turbines under contract, designed to receive the exhaust steam from ordinary reciprocating or intermittently operating engines, at about atmospheric pressure, and exhaust into vacuum, thus affording the cheapest and most simple means for increasing both the capacity and efficiency of engine plants by converting into useful power the residual steam energy, which has heretofore been wasted. This opens up practically a new industry here and one which promises to surpass in extent even the building of the Reynolds-Corliss, Nordberg, Reliance, Vilter, Filer-Stowell and other engines for which Milwaukee has long been celebrated.

Manufacturers of machine tools continue to find support mainly in the general industrial field and particularly from automobile, motor boat, vehicle, implement and contractors' machinery builders; but the general expectation is that by September 1, if not before, the larger lines of buying will show pronounced activity. The growing scarcity of available second-hand tools is having a beneficial effect on the market, and the vigorous demand for parts and patented specialties also keeps many of the less important shops out of pernicious price competition with their larger neighbors.

Selling representatives abroad send in very encouraging reports, and it is a fact of large significance for future trade that more separate articles of Northwestern manufacture are being disposed of in foreign countries at the present time, despite the relatively small amount of money involved in sales, than at any previous period. This means a more general introduction of American goods and consequent heavy increase in the total volume of business abroad when each of the lines develops such proportions as may normally be looked for.

Kearney & Trecker, West Allis, Wis., have had plans prepared for a new Corliss engine power plant. Contract for the steam boiler has been let to the Milwaukee Boiler Company.

A new 1000-hp. power plant is contemplated by the Good-year Company, Tomah, Wis., with change from steam to electric drive. A Westinghouse steam turbine for part of the above capacity is said to have been already contracted for.

The Cedar Rapids & Iowa City Railroad, whose power house at Cedar Rapids, Iowa, has a generating equipment of 3200 hp., will install about 1500 hp. additional boiler capacity, with stokers, heaters, feed water pumps, &c.

It is probable that a large new steam power plant will be erected in connection with the factory of the Kieckhefer Box Company, Milwaukee, which burned with a loss of \$200,000 and is to be rebuilt.

The Nordberg Mfg. Company, Milwaukee, is installing an air compressor and a hoisting engine, each of large capacity, at the Superior & Boston Mining Company's operation near Globe, Ariz.

The Power & Mining Machinery Company has installed a No. 6 gyratory crusher for the Marting Iron & Steel Company, Ironton, Ohio.

The Kenosha Gas & Electric Company, Kenosha, Wis., whose requirements were mentioned in this paper June 24, has decided upon the purchase of a 300-kw. Allis-Chalmers steam turbine, a 200-kw. Westinghouse motor generator set and three 125-kw. Westinghouse transformers.

The South Side Electric Company has been organized in Milwaukee by B. H. Glover and W. H. Malone, with quarters at 377 National avenue.

The city of Lindsburg, Kan., contemplates installing an engine driven electric generator of 150 kw., to furnish alternating current.

Contract for the new water works system at Norway, Mich., has been let to Prendergast & Fallon.

The Le Mars Water & Light Company, Le Mars, La., whose plant is equipped with electric machinery of an unusual frequency, will install a new 60-cycle generator.

The Antigo Electric Company, Antigo, Wis., contemplates the building of a new generating plant for alternating current to replace its present direct current system.

The Washington-Oregon Traction Company, Walla Walla, Wash., will shortly purchase three hydraulic turbines of 2400 hp. each, with generators of corresponding capacity, and auxiliary apparatus of every description, including 13 power transformers.

Cleveland Machinery Market.

CLEVELAND, OHIO, July 6, 1909.

The majority of the local machine tool houses and selling agents report a fair volume of business the past week. While some expect July and August to be dull months for the machinery trade, others regard the outlook more hopefully, pointing to the number of inquiries that are coming in as an indication that sales will hold up fairly well during the summer months. Orders during the week were mostly small—from one to three tools. A number of manufacturing plants in this vicinity are planning shop additions, and have inquiries out for lots of tools, ranging in value from \$5000 to \$15,000, for which orders are expected shortly. While some business is expected from the automobile trade, the next few months, it is believed, that the majority of the automobile plants have placed orders for the most of the additional machinery equipment needed for turning out their 1910 machines, and that the demand from this source will be light the balance of the season. A good volume of business, however, is expected the latter part of the year from the makers of automobile parts, orders for their additional requirements in machinery lines not being placed until contracts have been placed for their output and their wants are better known. In second-hand machinery the demand is less active than a few weeks ago and dealers have accumulated larger stocks.

Most of the local machine tool builders report a further improvement in orders. The situation in regard to heavy machinery shows little change and the demand is still light. Builders of locomotive cranes report a continued improvement in orders, but very few of these are coming from the railroads.

The general manufacturing situation in metal working lines continues to improve, but the jobbing foundry trade is not in a satisfactory condition. The local branch of the National Metal Trades Association reports more inquiries for skilled workmen the past week, both machinists and molders, than for any week for several months.

The Brown Hoisting Machinery Company, Cleveland, has received a contract from the Philadelphia & Reading Railroad for the erection of two Brown "Fast" ore handling plants at Port Richmond near Philadelphia. Each plant will have a 57-ft. bridge and 54-ft. cantilever and will be equipped with a 5-ton bucket. The company reports a decided improvement in the demand for locomotive cranes, the month of June almost being a record breaker in its orders for cranes. These orders came largely from industrial concerns, sales of locomotive cranes to railroads as yet being very limited. The company also reports a good demand from contractors for grab buckets.

The Canton Wood Turning Company, Canton, Ohio, has been incorporated, with a capitalization of \$250,000, to manufacture all kinds of wood turned handles. The com-

pany will move to Canton the machinery of a plant that has been operated at Killingly, Conn., for two years. It will be located in the plant formerly occupied by the Cheswick Mfg. Company. The incorporators are W. L. Ballou, L. A. Loichot, J. L. Loichot, Henry W. Hossler and Levi L. Deweese.

The Cleveland Chuck Company has been formed to place on the market an automatic two-jaw chuck for brass and iron working machinery. F. J. Ellsworth of the Adjustable Collet Company is president, and David B. Wittingham, formerly superintendent of the United Brass Mfg. Company, secretary. The company is located at 514 Garfield Building. It will not establish a plant, having arranged for the manufacture of its chucks by another company.

The Toledo Motor Company, successor to the Pope Motor Car Company, Toledo, Ohio, is overhauling its plant and it is understood that the company will be in the market soon for considerable additional machine tool equipment.

The Sheffield Car Company, Three Rivers, Mich., builder of railroad specialties, automobile trucks, &c., is buying machinery equipment for a large addition to its plant, on which work has just been started. The company is also planning to install a hydraulic power plant.

It is reported from Columbus, Ohio, that the Kinnell Edge Tool Forging Company, recently incorporated with a capitalization of \$30,000, will equip a new plant for the manufacture of butchers' tools, axes and other edged tools.

The plant of the Monarch Machine Company will be moved from Detroit, Mich., to Sidney, Ohio. Local capital has become interested in the enterprise and the Monarch Machine Company of Sidney has been incorporated with a capitalization of \$50,000.

The Early Sun Stove & Range Company, Newark, Ohio, has been incorporated, with a capitalization of \$20,000, by C. F. Dean, C. E. Ludy, G. A. Wise, E. J. Mathias and C. W. McAdams.

The Board of Trustees of the Ohio Hospital for Epileptics, Gallipolis, Ohio, will receive bids July 22 for two water tube boilers.

New England Machinery Market.

BOSTON, MASS., July 6, 1909.

The usual serious break accompanying a Monday holiday has affected the week's business, but not the underlying condition of the machine tool market, which is excellent. Manufacturers who were interviewed to-day express themselves as well satisfied with the outlook, the average statement being of improvement, with inquiries numerous and encouraging. With the dealers the average June business was, perhaps, less than in the preceding two months, but there were exceptions to this, one dealer having had the largest month's business for two years, while at least one other reports June as equaling the spring months.

Some idea of the prosperity of the brass business of the Naugatuck Valley may be had from the fact that the New York, New Haven & Hartford's yards at Waterbury, Conn., broke all previous months' records in June, the city standing second to Boston only throughout the road's system. Over 100,000 tons of freight were handled. The dividend disbursements of Hartford, Conn., and vicinity, July 1, totaled \$2,500,000, an increase of \$250,000 over the same period of last year, the total amount including \$449,000 from industrial securities. While a certain degree of falling off is anticipated during the new next month, it is not generally believed, basing the estimate on the experience of the manufacturers, that the change will be very important. As to machinery orders placed with the dealers recently, few, if any, may be called large, but a good many of them reached very respectable totals.

A settlement has been effected of the damages sustained by the Osgood Bradley & Sons Company, Worcester, Mass., in the abolition of the city's grade crossings, the railroads having agreed to pay a sum of money reaching a large figure. So much of the land occupied by the company's car works was taken that the alternative was faced of going out of business or building a new plant elsewhere in the city. The fact of an early settlement will probably result in the continuation of the business, possibly on a larger scale. No definite plans have been made, however, nor is it known that the company has acquired a new site. This is one of the few car building concerns in the East which remain independent of the consolidation effected a few years ago.

A dispatch from Providence, R. I., states that Henry B. Segar, Westerly, R. I., has been appointed temporary receiver of the Nichols & Langworthy Machine Company, Hope Valley, R. I., whose works were recently destroyed by fire, with loss of \$200,000.

The Aeolian Company, Meriden, Conn., manufacturer of musical instruments, is to erect a new factory, 40 x 52 ft., five stories, of reinforced concrete. The company states that it is not yet prepared to make announcement as to machinery and other equipment.

The addition which will be added to the plant of the Waterbury Battery Company, Waterbury, Conn., will be 45 x 134 ft., two stories. The company manufactures electric batteries.

The Noiseless Typewriter Company has taken possession of the factory of the Eisenhuth Horseless Vehicle Company, Middletown, Conn., and will proceed immediately to equip it for manufacturing.

The Columbia Motor Car Company, Hartford, Conn., which will operate the works of the Electric Vehicle Company of that city, has completed its organization by the election of officers and the formal transfer of the assets of the old company to the new. The capital stock has been increased to \$3,000,000. Herbert Lloyd, Philadelphia, is president; Henry W. Nuckols, Hartford, vice-president, treasurer and manager, and these officers with Walter G. Henderson, Philadelphia; William Hooker Atwood, New Haven, Conn., and Kenneth B. Schley, New York, constitute the Board of Directors. The assets taken over include the Selden Patents, under which a large percentage of motor cars produced in this country are manufactured. It is stated that the business will be conducted on a larger scale than before and that the 1910 models are ready, and the factory will soon take on largely increased working forces.

The Ringling Bros. Company, which controls a large part of the circus business of the country, is contemplating the establishment of large shops at Bridgeport, Conn., for the purpose of manufacturing its own cars and paraphernalia.

The effort to make the Connecticut River navigable from Hartford to Springfield and Holyoke, and at the same time to develop large additional water power, has taken the form of a new bill presented to Congress, which means the consolidation of hitherto rival interests, the Enfield Power Company and the Northern Connecticut Power Company. The river being under control of the Federal Government, it is held that Congress has a right to grant the power asked for in the bill, which provides for the erection of a dam at the foot of the Enfield rapids, Enfield, Conn., and power houses for the generating of electric power, together with a lock which would make possible the navigation of the river and would be free of toll and under the control of the Government. However, this development would wipe out the property of the Connecticut River Power Company, which supplies the industries of Windsor Locks, Conn., with their power, and for this reason the bill will not go uncontested.

The project is on foot to build an electric railroad from Togus to Warren, Maine, through the town of Washington, a distance of 30 miles in country which at present has no rail outlet. The matter is under consideration by General Manager Harry B. Ivers of the Lewiston, Augusta & Waterville Trunk Line, and it is said that he and the Graham interests, which he represents, regard the matter favorably. Another new street railroad project is that of the Attawaugan Street Railway Company, which has been granted a charter by the Connecticut Legislature to build a line from Dayville to Killingly and from Attawaugan to Alexanders Lake in that State. The capital stock authorized is \$50,000, with the right to increase to \$100,000.

New manufacturing projects just announced include the following: Merrimack Mfg. Company, Lowell, Mass., weave shed, 134 x 174 ft., two stories and basement; Frank H. Lee and Harry McLachlan, Danbury, Conn., factories, 40 x 320 ft., four stories; 40 x 110 ft., three stories, and 40 x 310 ft., two stories, totaling 90,000 sq. ft. of floor space, to house the Lee Hat Mfg. Company, Lee Soft Hat Company, S. A. G. Hat Company and Harry McLachlan & Co.; F. M. Hoyt Shoe Company, Manchester, N. H., building to employ 250 hands.

The city of Westfield, Mass., has received bids for the extension of the municipal power plant on the basis of 500 and 750 kw., and including generator, engine of either turbine or reciprocating type and the various electric appurtenances.

The North Adams Gas Light Company, North Adams, Mass., which is controlled by the Massachusetts Lighting Company, is planning the expenditure of \$100,000 for a new steel power house and improved equipment.

Government Purchases.

WASHINGTON, D. C., July 6, 1909.

The Bureau of Yards and Docks, Navy Department, Washington, will receive bids until July 24 for three vertical cross compound condensing steam engines for the Philadelphia Navy Yard.

The Isthmian Canal Commission will receive bids until July 26, Circular No. 521, for locomotive coaling cranes and other supplies.

The following bids were opened June 29 for machinery for the navy yards:

Class 1.—One electric traveling hoist—Bidder 10. Brown Hoisting Machinery Company, Cleveland, Ohio, \$1100; 23. Alfred Box & Co., Philadelphia, Pa., \$670; 26. Butte Engineering & Electric Company, New York, \$790; 40. Cleveland Crane & Engineering Company, Wickliffe, Ohio, \$510; 42. Case Mfg. Company, Columbus, Ohio, \$565; 74. Henshaw, Bulkley & Co., San Francisco, Cal., \$770; 77. Hoisting Machinery Company,

New York, \$770; 108, Niles-Bement-Pond Company, New York, \$650 and \$560; 141, Sprague Electric Company, New York, \$770; 162, Williamson Brothers Company, Philadelphia, Pa., \$1286 and \$1326; 169, Yale & Towne Mfg. Company, New York, \$768; 176, Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., \$635.

Class 51.—One saddle tank locomotive—Bidder 4, American Locomotive Company, New York, \$4700 and \$4200; 47, Davenport Locomotive Works, Davenport, Iowa, \$5490 and \$5740; 97, Lima Locomotive & Machine Company, Lima, Ohio, \$5700; 155, Vulcan Iron Works, Wilkes-Barre, Pa., \$4335; 168, Wonham, Magor & Sanger, New York, \$4435.50.

Class 61.—One surface condenser—Bidder 8, Alberger Condenser Company, New York, \$1175; 14, Blake & Knowles Steam Pump Works, New York, \$1042; 37, A. S. Cameron Steam Pump Works, New York, \$1180; 48, M. T. Davidson, Brooklyn, N. Y., \$1025; 152, Union Steam Pump Company, Battle Creek, Mich., \$1012; 154, Vermilye & Power, New York, \$1049; 159, C. H. Wheeler Mfg. Company, Philadelphia, Pa., \$995; 165, Wheeler Condenser & Engineering Company, Carteret, N. J., \$1138.

The following bids were opened June 22 at the office of the Treasury Department, Washington, for water tube boilers for the appraiser's warehouse, New York:

Evans-Almral & Co., New York, \$37,398; William J. Olvany, New York, \$38,218; Phillips, Doup & Co., Brooklyn, N. Y., \$41,289; James Canan Mfg. Company, New York, \$46,819; E. Rutzler Company, New York, \$44,810.

The following bids were opened June 8 for one duplex steam pump for the lighthouse depot at Tompkinsville, N. Y.:

Henry R. Worthington, New York, \$685, accepted; Fred M. Prescott Steam Pump Company, New York, \$759; Fairbanks, Morse & Co., New York, \$818.

Under requisition 169, bids opened June 21 for machinery for the United States Naval Powder Depot, New Jersey, the following awards have been made:

Frevort Machinery Company, New York, one 24 x 24 in. by 5 ft. Powell planer.

The American Steel & Wire Company's Pension List.

The American Steel & Wire Company maintains a pension department under the supervision of a board of administration, composed of William P. Palmer, J. S. Keefe, C. L. Miller, F. H. Daniels and Stephen W. Tener. The manager of the department is Stephen W. Tener, Western Reserve Building, Cleveland, Ohio. It was established January 1, 1902. The payment of pensions is entirely voluntary on the part of the company, and the fund is maintained by the company, there being no tax of any kind against the wages of the employees. The following are eligible:

a. All employees who shall have attained the age of 65 years and who have been in the service of the company or any of its predecessors during the preceding 10 years.

b. All employees 55 to 65 years of age, who shall have served the preceding 10 years and shall in the opinion of the board of administration have become physically disqualified for further service.

From a recent statement issued by the company the following table is taken, showing the disbursements under this arrangement for four years:

					Number of pensioners December, 1908.
Pittsburgh District:	1905.	1906.	1907.	1908.	
South Side Works.....	\$103.20	\$103.20	\$34.40	.....	...
Braddock Works.....	60.00	182.70	198.40	\$185.70	3
Rankin Works.....	416.58	447.00	628.60	755.65	8
Beaver Falls Works.....	113.16	113.16	113.16	113.16	1
Donora Wire Works.....	347.40	347.40	347.40	347.40	1
Allentown Works.....	280.72	770.77	782.35	995.04	11
Saenoberger Works.....	1,960.54	2,337.11	2,370.56	2,382.46	18
Totals	\$3,281.60	\$4,301.34	\$4,474.87	\$4,779.41	42
Cleveland District:					
Office	\$310.20	\$310.20	\$103.40	.....	...
Consolidated Works.....	401.80	604.65	946.05	\$1,271.45	11
American Works.....	1,274.76	1,714.04	2,005.15	2,888.85	30
H. P. Works.....	1,438.03	1,464.27	1,668.44	2,135.09	21
Newburgh Wire Works.....	1,860.05	2,629.27	3,515.22	4,817.49	33
Sharon Works.....	.....	.....	60.00	309.30	3
Salem Works.....	405.72	475.92	586.67	724.92	6
Newburgh Steel Works.....	3,403.93	3,974.55	4,210.84	4,771.62	32
Central Furnaces.....	231.25	218.88	218.88	218.88	2
Totals	\$9,325.74	\$11,391.78	\$13,314.65	\$17,137.60	138
Chicago District:					
Waukegan Works.....	\$187.59	\$387.49	\$660.48	\$681.48	6
De Kalb Works.....	797.56	1,319.56	1,332.36	1,820.76	16
Anderson Works.....	259.35	337.20	436.15	748.40	8
Scott Street Works.....	215.40	353.28	470.88	505.88	5
Rockdale Works.....	591.61	650.64	551.64	638.44	4
Totals	\$2,051.51	\$3,048.17	\$3,451.51	\$4,394.96	39
San Francisco District:					
Pacific Works.....	\$306.15	\$294.72	\$294.72	\$294.72	3
Worcester District:					
North Works.....	\$9,086.63	\$10,846.95	\$11,261.48	\$11,881.28	77
South Works.....	6,425.15	8,028.87	8,345.25	10,140.56	77
Totals	\$15,511.78	\$18,875.82	\$19,606.73	\$22,021.84	154
Totals for each year.....	\$30,476.78	\$37,911.83	\$41,142.48	\$48,628.53	376

Manning, Maxwell & Moore, New York, one 22-in. Hendey lathe.

D. Saunders' Sons, Yonkers, N. Y., one 6-in. pipe machine.

The following awards have been made for machinery for the Isthmian Canal Commission, bids for which were opened June 14, Circular No. 512:

Tasker & Strawbridge, Philadelphia, Pa., class 4, one 15-hp. gasoline motor, \$605.50; class 5, one 10-hp. gasoline motor, \$520.50.

Alfred Box & Co., Philadelphia, Pa., class 9, one motor driven trolley, \$175; class 10, one electric hoist, \$300.

Manning, Maxwell & Moore, New York, class 11, one horizontal boring and drilling machine, \$3225; class 14, one belt driven horizontal punch, \$940.

J. A. Fay & Egan Company, Cincinnati, Ohio, class 12, one vertical hollow chisel mortising and boring machine, \$2225.

Under bids opened June 21, Circular No. 514, for machinery for the Isthmian Canal Commission, Montgomery & Co., New York, have been awarded class 33, one screw cutting engine lathe, \$210.

The Republic Iron & Steel Company will shortly let contracts for the equipment of its new pipe mills at Haselton, Ohio. It will make pipe up to 12 in. in diameter. These mills are not expected to be ready for operation before April 1, 1910.

The Heaviest Freight Train Ever Hauled by One Locomotive.

By far the heaviest freight train ever hauled by one locomotive on any railroad in this country, and probably in the world, has been moved over the Pennsylvania Railroad, between Altoona and Enola, near Harrisburg, Pa. On June 22 a single locomotive, No. 1113, of the H-8-b type, built at the company's Altoona shops, pulled a train of 105 steel cars, loaded with 5544 tons of coal, for 127 miles, in 7 hours and 12 minutes, or at an average speed of 17.6 miles an hour. The entire train, including engine, caboose and cars, weighed 7644 tons, or 15,288,000 lb., and the coal alone 5544 tons. The train stretched along the track for 3600 ft., more than two-thirds of a mile. This record movement marks the culmination of a series of tests made for the purpose of determining the hauling power of the most improved types of locomotives used in the regular freight service of the Pennsylvania Railroad over the best grades of the system. That part of the line over which the test was made from Altoona to Enola presents at no point a greater grade than 12 ft. to the mile.

HARDWARE

THE question about the feasibility of retail Hardware merchants uniting their orders or in some way buying their goods together is evidently a live topic, notwithstanding the fact that there have been many unsuccessful efforts in this direction. There is, however, apparently a feeling with many progressive merchants that in these days there is so much getting together and acting together that something of this kind might be done in connection with the purchase of Hardware. The necessity which the retail Hardware merchant recognizes of buying his goods at low prices to enable him to meet the quotations of the department stores and catalogue houses is evidently the chief influence which impels him to look for some system which will give him his goods at about the prices which are paid by these great competitors of his. There has not, however, yet been found a way in which the scattered merchants throughout the country can do this, except to a limited extent and on a few kinds of goods. The desired end is fairly well accomplished in a very few cities, but no general plan has been discovered by which the Hardware merchant in the towns and villages can do this. Notwithstanding the failures which have so frequently attended such efforts it is evident that the attempt has not yet been abandoned. Perhaps something to help the retailers may come from the jobbers themselves, as they are able to devise means to aid the retailer distributors with specially low prices in certain cases, saving them from the temptation to form syndicates or to go direct to the manufacturers.

How to apply the principle that definite responsibility placed on an employee tends to call out his best ability is a question which should have constant attention in store and factory. One direction in which it can be applied is illustrated in the practice of some Hardware merchants to subdivide the buying—a department of the business which in a great many retail stores does not receive anything like the attention it deserves. This work is usually done by the proprietor or one of the partners. He presumably has greater skill, larger experience, more knowledge of the business and wider sources of information than any one in his employ. He cannot, however, do everything. With many irons in the fire some of them are likely to burn. In a business of any size there are so many cares and duties devolving upon him that it is often desirable that he assign definite responsibility to certain trusted and experienced clerks. For example, he may intrust one of them with the purchasing of certain associated lines, making it to be his work to keep track of stock, note the requirements of the trade, become familiar with the manufacturers and their products, keep posted on the market, meet traveling representatives selling these goods, and, in short, do the buying—all of course subject to the advice and approval of his principal. Such a method frequently works well. It should relieve the proprietor and at the same time secure more detailed and better attention to the purchase of the goods in question. The opportunity given to develop the abilities of an employee is another consideration which should not be overlooked.

Condition of Trade.

Trade conditions indicate little change in either price or volume, the vacation period contributing its proportion to the customary midsummer dullness. The spurt which began several weeks ago has spent itself and there is a corresponding slackening in orders. The overhauling of manufacturing plants, usual with many at this season, together with stocktaking, especially by Southern merchants, helps also to retard business. While there has been a stiffening in some lines of iron and steel products, the general run of merchandise is sympathetically weaker, without, however, any marked reduction in prices. Buyers in possession of substantial orders can undoubtedly obtain concessions, but for the average run of specifications little change in price is observable. The consensus of opinion is that stocks are low, whether in the hands of manufacturers, wholesalers or retailers, and some curiosity is expressed regarding available sources of supply when a sharply increased movement begins, based on favorable crops, tariff settlement and the beginning of regular fall demands. In an important line reference has been made to an improvement which has steadily progressed since last year with better collections. Current business seems farther advanced and in better volume in Western territory than in the more conservative East.

Chicago.

The market is beginning to feel the effects of the usual midsummer lull, as a result of which some slowing up in new demand is noted. Anticipated requirements for this period have been pretty well covered, especially in the heavier staples, by contracts made some time ago, shipments against which are moving in large volume. The wire mills are extremely busy with the execution and shipment of orders, and deliveries in Nails and Barb Wire are more or less retarded, some of the leading producers being already from four to six weeks behind. Since the bulk of specifications in these lines represent jobbers' stock orders, no serious inconvenience is at present expected from this delay. A firmer tone exists in prices generally, although on some good buyers are able to profit by the eagerness of sellers to secure business. The opportunities, however, for securing important concessions from ruling prices are gradually narrowing and the tendency appears to be toward a firmer maintenance of values. In Screws, for instance, manufacturers are declining to renew low priced contracts now expiring upon the old basis, which in many cases is understood to have been below the recognized schedule. Although nominally unchanged, the market on these goods is decidedly firmer and the same conditions prevail to a greater or less extent in other lines. The effects of bargain prices at which manufacturers purchased liberal tonnages of Steel Bars some weeks ago are reflected in extra discounts that are being offered on Bolts, the market having developed considerable irregularity within the past week or two. Reports from local dealers indicate a demand that, for the season, is very near normal. Perhaps the strongest sustaining influence underlying the Hardware trade in this market is that of activity in building, which thus far this year has been greater than ever before in the history of the city. The building permits issued for the first six months of 1909, although including fewer structures, amounted in cost to \$50,460,930, against \$29,558,275 in the same period last year. There are now under construction several large buildings in the central district of the city, whose total requirements in building Hardware will aggregate around \$150,000. In addition there-

to are the demands arising from the great number of flat buildings, apartments and residences now under construction.

NOTES ON PRICES.

Wire Nails.—As is usual at this season new business is less active and smaller in volume. Some delay is experienced in shipments on the heavy business booked by the mills early in May, which will keep the mills busy for some time to clear up. Leading mills are now accepting contract orders for shipment within 60 days from date, which they have not been doing since the reduction in price to \$1.60, base, was made, and later advanced to \$1.70, base. Quotations are as follows, f.o.b. Pittsburgh, plus actual freight to point of delivery, 60 days, or 2 per cent. discount for cash in 10 days:

Carloads, to jobbers.....	\$1.70
Carload lots to retail merchants.....	1.75
Less than carloads to jobbers.....	1.75
Less than carloads to retail merchants.....	1.85

New York.—The week has been devoid of any special features of interest in the local Wire Nail market. Business has been on a moderate scale, and Nails are held in small lots at store, on the basis of \$1.90 per keg.

Chicago.—The volume of new orders is gradually diminishing, but specifications against contracts continue to come in at a rate that promises to keep the mills going at full capacity through the summer months. But for the fact that jobbers' stocks have already been fairly well replenished by prior shipments, there would be more complaint on account of retarded deliveries, which are by no means as prompt as they were a few weeks ago. Prices are reported to be uniformly maintained by the leading mills, and the impression prevails that an advance is impending, though when it will be announced can only be conjectured. We quote \$1.88, Chicago, in car lots to jobbers and \$1.93 in car lots to retailers, with an advance of 5 cents for less than car lots from mills.

Pittsburgh.—A new feature in the Wire Nail market is that the leading mills are now willing to take contracts at present prices for shipment within 60 days from date, this custom not having been prevalent for several months or since the heavy cut in Nails was made, when the price was reduced to \$1.60 per keg and afterward advanced to \$1.70 per keg. New demand for Wire Nails shows a falling off, as it always does at this season of the year, but the mills have a very heavy tonnage on their books, and consumers are specifying liberally against contracts. One leading mill has not had any men out on the road for about six weeks, having about all the business on its books at present prices it cares to have and believing the market will be higher before long. The amount of orders on the books of the mills indicate they will operate practically full capacity through the summer months, and with the tendency in the market for higher prices on Steel Billets the trade still inclines to the belief that Wire Nails will be advanced again, but this may not be done until shortly before fall trade opens up. The market on Wire Nails is firm on the basis of \$1.70 per keg in carload and larger lots, f.o.b., Pittsburgh.

Cut Nails.—A continuance of the improvement in new demand is gradual, but not up to the full capacity of the mills. Jobbers are specifying on contract orders quite freely. This has the tendency to increase the firmness of prices, which are not, however, maintained at regular quotation of \$1.80 base, f.o.b. Pittsburgh, but are subject to concession of about 10 cents per keg. Iron Cut Nails are held at an advance of 10 cents per keg over Steel Cut Nails in the Western market, but in the East this differential is not observed.

New York.—A comparatively light demand represents the local market on Cut Nails, which are held on the basis of \$1.90, in small lots at store.

Chicago.—The market is decidedly firmer, and the best price now available from the mills is reported to be 8 cents a keg higher than the previous quotation. A Western mill which ordinarily figures in this market is shut down, and this naturally has a bearing upon the situation. It is also noted that the unusual spread be-

tween Iron and Steel Cut Nails has been narrowed, and is now represented by a difference of 15 cents instead of 20 cents a keg. Revised prices are quoted as follows: In car lots, to jobbers, Steel Cut Nails, \$1.88; Iron Cut Nails, \$2.03.

Pittsburgh.—The volume of new business in Cut Nails is showing steady betterment, but is still short of being heavy enough to give the mills full work. Jobbers are specifying quite freely against contracts, and the mills are firmer in their ideas as to prices. We quote Cut Nails at the regular price of \$1.80 per keg base, f.o.b. Pittsburgh, but this price is being shaded to the extent of about 10c. per keg on desirable orders.

Barb Wire.—New business is showing a falling off, as compared with a month ago, and is now light. The mills are making shipments on orders taken in May, and these are heavy. Prices are well maintained at regular quotations, which are as follows, f.o.b. Pittsburgh:

	Painted.	Gal.
Jobbers, carload lots.....	\$1.70	\$2.00
Retailers, carload lots.....	1.75	2.05
Retailers, less than carload lots.....	1.85	2.15

Chicago.—After an unusually prolonged season the demand for Barb Wire has dwindled down to a few scattered orders. The mills are busy with the execution of orders taken immediately after the sharp reduction of prices May 1. Shipments of specifications against these contracts constitute the bulk of the business now moving. The market is firm and unchanged, as follows: To jobbers, Chicago, car lots, Painted, \$1.88; Galvanized, \$2.18. To retailers, car lots, Painted, \$1.98; Galvanized, \$2.23; retailers, less than car lots, Painted, \$2.03; Galvanized, \$2.33. Staples, bright, in carlots, \$1.88; Galvanized, \$2.18; car lots to retailers, 10 cents extra, with an additional 5 cents for less than car lots.

Pittsburgh.—The season has about closed and only a few small scattering new orders are being received. Shipments by the mills against contracts are fairly heavy and will likely continue so during the greater part of this month. Prices as established on May 15 are being firmly held, we are advised, and we continue to quote Galvanized Barb Wire at \$2 and Painted at \$1.70 in carload and larger lots, f.o.b. Pittsburgh.

Plain Wire.—Some difficulty is being experienced by consumers of Wire in obtaining as prompt shipments as they desire on business placed with the mills some time since. New business shows an increase from some sections of the country, but from others it is light. The market is firm and quotations per 100 lb. to jobbers in carload lots are as follows, on a basis of \$1.50 for Plain and \$1.80 for Galvanized, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days, the usual price to retailers being 5 cents additional:

Nos.....	0 to 9	10	11	12	12½	13	14	15	16
Annealed.....	\$1.50	1.55	1.60	1.65	1.75	1.85	1.95	2.05	
Galvanized....	1.80	1.85	1.90	1.95	2.05	2.15	2.25	2.35	

Chicago.—Manufacturers are placing contracts for future requirements running as far ahead as January 1. On extended deliveries it is stated that a premium over the present market is being asked, though on orders for delivery 60 days ahead current prices apply. Unless some unfavorable development in the crop situation arises, a heavy fall demand for Fencing is looked for, which will call for liberal purchases of Plain Wire. The market is very firm and we quote as follows: Car lots, to jobbers, \$1.68, base, f.o.b. Chicago.

Pittsburgh.—New demand is very light, as the season is pretty well over, but shipments by the mills against contracts continue fairly heavy. The mills are pretty well filled up for the next 60 days, and it is not improbable that prices may be advanced when these orders have been cleaned up, more especially in view of the higher tendency in prices of Bessemer and open hearth Billets. We quote Plain Wire at \$1.50 and Galvanized at \$1.80 in carload and larger lots, f.o.b. Pittsburgh, subject to the usual terms.

Window Glass.—It is estimated that at present there are about a dozen hand operated Window Glass plants producing Glass, representing in the neighborhood of a 450-pot capacity. Some of the factories are said to con-

template running during July and others calculate to continue in operation during the summer. A continued period of extremely hot weather might naturally cause a change in the plans of the factories which at present anticipate working continuously. Production has been in advance of demand, as buying is light. The reduction in the tariff on Window Glass, as at present proposed, may have deterred some large buyers from placing orders for the domestic article. Prices recommended by the Eastern Window Glass Jobbers' Association, from jobbers' list, October 1, 1903, for territory east of the Mississippi are as follows: New England and Middle States, from jobbers', Single, 90 and 35 per cent.; Double, 90 and 40 per cent.; factory shipments, Single, 90 and 45 per cent.; Double, 90 and 50 per cent.; some portions of Pennsylvania are accorded discounts 5 per cent. better than other States; in the Southern States discounts vary from 90 and 25 to 90 and 40 per cent. on Single and from 90 and 30 to 90 and 45 per cent. on Double, from jobbers.

The list prices on which manufacturers base their discounts to jobbers and the one jobbers use when selling to the retail trade are here given for the information of retail merchants. When the jobbers' list was adopted the idea was to have it represent an advance on the manufacturers' list of about 25 per cent., so that the same discount could be applied to both lists. This plan of using one discount for both lists has not been carried out through all the vicissitudes to which the Window Glass market has been subjected since 1903. By referring to the lists it will be seen that Bracket Sizes are designated by united inches. United inches are determined by adding together the length and breadth of the largest size in a bracket. The largest size sheet in the first bracket is 10 x 15, and adding these together it is found to contain 25 united inches. By multiplying the length by the breadth we find that it contains 150 superficial inches. The sizes 11 x 14 and 12 x 13, in the second bracket, each contain 25 united inches, but the first contains 154 superficial inches and the second 156 superficial inches. The reason these sizes are put in the second bracket is because they contain more superficial inches than the largest size in the first bracket. This rule obtains throughout the entire list. Each box contains approximately 50 sq. ft. of Glass. There are some exceptions to this rule in the larger sizes, boxes of which may contain as much as 70 sq. ft., as no less than three sheets of Glass are packed in a box. In such instances the lists are made large enough to cover the extra amount of Glass.

Rope.—The volume of business being received by manufacturers shows no material change, and continues on conservative lines, covering, for the most part, nearby requirements. The market is a trifle lower on both Manila and Sisal Hemp than it was last week, but not enough to affect the price of Rope. The market may be represented by 8¼ to 8½ cents per pound, base, for Pure Manila of the highest grade and a corresponding quality of Sisal at 7½ to 7¾. Lower grades of Pure Manila can

be purchased at ¼ cent less than the foregoing quotations. Second grade Sisal is quoted at 6½ cents and third grade at 6 cents per pound. Jute, ¼ in. and up, No. 1, is quoted at 6¼ to 6½ cents and No. 2 at 5¼ to 5½ cents.

Binder Twine.—Since our last report improved crop conditions indicate larger requirements in the way of Twine. Gains are shown in reports in the general condition of winter and spring Wheat and Oats. This, in connection with Fiber prices, has given the Twine market a stronger tone. By some who are in close touch with the market an advance in prices is regarded as improbable this season, while they would not be surprised to see higher prices next year. If this opinion proves to be correct it will be some consolation to merchants who are obliged to carry Twine over. Schedule prices are as follows:

	Cents per lb.
Sisal	7½
Standard	7½
Standard Manila (550 ft.)	8
Manila (600 ft.)	8½
Pure Manila	10

American Window Glass.

Manufacturers' List.

List Jan. 1, 1901.
Per box 50 sq. ft.

United Inches.	Bracket Sizes.	Single.			Double.		
		AA	A	B	AA	A	B
25	6x 8 to 10x15	\$24.00	\$20.00	\$19.00	\$32.00	\$28.00	\$26.50
34	{ 11x14 } { 12x13 } " 14x20	25.00	21.00	20.00	35.00	31.00	29.00
40	{ 10x26 } { 18x22 } " 16x24	27.00	22.50	21.00	39.00	34.00	31.00
50	{ 20x20 } { 15x36 } " 20x30	28.00	23.75	22.00	42.00	37.00	34.50
54	{ 26x28 } { 26x34 } " 24x30	29.00	24.50	22.50	43.00	38.00	35.00
60	{ 30x30 } { 32x38 } " 24x36	30.00	26.00	23.25	44.00	39.00	35.50
70	{ 34x36 } { 30x50 } " 30x40	32.00	28.75	25.25	47.00	42.00	38.00
80	{ 34x52 } { 30x56 } " 30x50	36.50	33.25	28.75	51.00	46.00	41.50
84	{ 34x58 } { 30x60 } " 30x54	39.00	35.50	31.25	52.00	47.00	42.50
90	{ 40x62 } { 40x66 } " 34x56	---	---	---	55.00	50.00	46.00
94	{ 40x72 } { 40x76 } " 34x60	---	---	---	56.00	51.00	47.00
100	{ 40x80 } { 40x84 } " 40x60	---	---	---	66.00	60.00	56.00
105	{ 40x88 } { 40x92 } " 40x64	---	---	---	71.00	65.00	60.00
110	{ 40x96 } { 40x100 } " 40x70	---	---	---	79.00	73.00	68.00
115	{ 40x104 } { 40x108 } " 40x74	---	---	---	89.00	81.00	76.00
120	{ 40x112 } { 40x116 } " 40x80	---	---	---	105.00	95.00	90.00

An additional 10 per cent. will be charged for all Glass more than 40 inches wide. All sizes over 52 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches bracket. All Glass 54 inches wide or wider, not making more than 116 united inches, will be charged in the 120 united inches bracket. Sizes above 120 united inches, \$10 per box extra for every 5 inches.

American Window Glass.

Jobbers' List.

List Oct. 1, 1903.
Per box of 50 sq. ft.

United Inches.	Bracket Sizes.	Single.			Double.		
		AA	A	B	AA	A	B
25	6x 8 to 10x15	\$32.00	\$26.75	\$25.50	\$42.75	\$37.50	\$35.50
34	{ 11x14 } { 12x13 } " 14x20	33.50	28.00	26.75	46.75	41.50	38.75
40	{ 10x26 } { 18x22 } " 16x24	36.00	30.00	28.00	52.00	45.50	41.50
50	{ 20x20 } { 15x36 } " 20x30	37.50	31.75	29.50	56.00	49.50	46.00
54	{ 26x28 } { 26x34 } " 24x30	38.75	32.75	30.00	57.50	50.75	46.75
60	{ 30x30 } { 32x38 } " 24x36	40.00	34.75	31.00	58.75	52.00	47.50
70	{ 34x36 } { 30x50 } " 30x40	42.75	38.50	33.75	62.75	56.00	50.75
80	{ 34x52 } { 30x56 } " 30x50	48.75	44.50	38.50	68.00	61.50	55.50
84	{ 34x58 } { 30x60 } " 30x54	52.00	47.50	41.75	69.50	62.75	56.75
90	{ 40x62 } { 40x66 } " 34x56	---	---	---	73.50	66.75	61.50
94	{ 40x72 } { 40x76 } " 34x60	---	---	---	74.75	68.00	62.75
100	{ 40x80 } { 40x84 } " 40x60	---	---	---	88.00	80.00	74.75
105	{ 40x88 } { 40x92 } " 40x64	---	---	---	94.75	86.75	80.00
110	{ 40x96 } { 40x100 } " 40x70	---	---	---	105.50	97.50	90.75
115	{ 40x104 } { 40x108 } " 40x74	---	---	---	118.75	108.00	101.50
120	{ 40x112 } { 40x116 } " 40x80	---	---	---	140.00	126.75	120.00
125	{ 40x120 } { 40x124 } " 40x84	---	---	---	153.50	140.25	133.50
130	{ 40x128 } { 40x132 } " 40x88	---	---	---	167.00	153.75	147.00

An additional 10 per cent. will be charged for all Glass more than 40 inches wide. All sizes over 52 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches bracket. All Glass 54 inches wide or wider, not making more than 116 united inches, will be charged in the 120 united inches bracket.

Carloads are ¼ cent less; 5-ton lots, ¼ cent less; fall terms; central delivery. For delivery at Missouri River and Northwestern distributing points ¼ cent is added.

Linseed Oil.—The market continues without change in prices, with demand for moderate quantities, these

being largely withdrawal on contract orders. The first half of July is usually expected to be dull and the present period shows no indication of any change in this respect. Oil in second hands can be purchased at slightly lower prices than regular quotations in carload lots. Local business for small lots is comparatively light. Quotations for 5 bbl. or more are as follows: State and Western Raw, 60 cents per gallon; City Raw, 61 cents per gallon, with the usual advance of 1 cent for less than 5-bbl. lots. Boiled Oil, 1 cent advance on Raw.

Spirits Turpentine.—The market has advanced 1½ cents per gallon over quotations of a week ago on advices from Savannah. Considerable buying for export is reported from that point and receipts continue light. A small business was transacted in the local market. The New York market is represented by the following quotations: Oil Barrels, 47 to 47½ cents; Machine Made Barrels, 47½ to 48 cents per gallon.

New Method of Invoicing Stock.

In taking its inventory at the close of last year a new method of invoicing was tried in some departments by the A. J. Harwi Hardware Company, Atchison, Kan. It was not adopted through the entire house, but was tried out on two floors.

The old method on the two floors referred to, as well as elsewhere in the building, was to begin stock taking about the first of December. The stock clerks wrote down the items on small slips of paper which were placed in places convenient to the stock. Then the order clerks made corrections on the slips as goods were shipped out between the time when counting began and the first day of January. This system was found to be

A Cause of Many Mistakes.

since the slips had to be corrected without checking back, and errors were continually made, not only in correcting the slips as goods were taken away, but in transferring the quantities to the inventory blanks. The new system was developed in the effort to avoid the use of slips and

about a day and a half. Besides avoiding the errors and disadvantages of transcription the fact that

The Buyers Did the Writing

went a long way toward preventing mistakes, as each was thoroughly familiar with the stock through his purchases during the year and could tell approximately when he heard a quantity called whether or not it was likely to be correct. The completion of the job in a short space of time was facilitated by having the clerks go over the entire stock in advance, straightening and cleaning it up, as they had opportunity, and piling the goods in even piles so that counting would be easy. The minute the stock was down it was ready to be extended, having been priced when it was run off on the typewriter.

Speed and Accuracy.

The company states that it obtained on these two floors the quickest and most accurate inventory it ever took, and the experiment was so successful that in the future it will be carried out throughout the entire establishment.

A Dallas Motto.

THE spirit and enthusiasm of Dallas, Texas, are represented in a card which is used in that enterprising city. The first side is as follows:

We Will make Dallas the
Greatest City in the South!
The Opportunity Exists
Grasp it!

On the reverse is this emphatic suggestion of prompt action:

DO IT NOW

In this there is a pointer to enterprising merchants in other places, who may not only adapt the method to their

East Aisle North.		Fourth Floor.	
Doz. No.	52	Rice Boilers	5.60
" "	53		6.60
" "	54		8.40
" "	06	Wash Bowls	45
" "	06-1/2		50
" "	07		55

Portion of Inventory Sheet as Prepared by A. J. Harwi Hardware Company Before Inventory Was Taken.

consequent errors. The heads of the departments in which the trial was made had

Blank Forms Type Written.

based on their stock books and covering all the goods found on these floors. A portion of one of the blanks so prepared is shown in the accompanying illustration. Full size foolscap sheets were used, and the items were entered according to class, forming a skeleton of the stock just as it lay, which was at the same time priced in full.

At the time of inventory the date being December 26, the buyers of all the departments on the two floors went through them with the sheets which had been prepared and themselves filled in with pencil the quantities of stock on hand as they were called off by the stock clerks. One floor was taken in this manner in a single day, beginning at 8.30 in the morning, and the other in

own use, but may also be minded to apply the spirit of the suggestion in the conduct of their own business.

THE D. & F. KUSEL COMPANY, Watertown, Wis., on the 26th ult., celebrated the sixtieth anniversary of the founding of the business in that place by Daniel Kusel. From the modest beginning in 1849 the business has steadily expanded until now one of the largest and most substantial structures in the city, 108 to 112 West Main street, a three story and basement building, is occupied. Upon the retirement of the founder some years before his death in 1905, his two sons, Daniel H. and Fred Kusel, succeeded to the management of the business under the style of D. & F. Kusel. Subsequently the business was incorporated under the style of D. & F. Kusel Company, with a capital of \$50,000.

PACIFIC COAST PROGRESS.

JAMES D. FLEMING, vice-president of the Lalance & Grosjean Mfg. Company, manufacturing Agate Nickel-Steel Ware, Kitchen and House Furnishings, has just completed an annual trip to the Pacific Coast, begun May 10. What greatly impressed him was the physical regeneration of San Francisco in relation to the erection of fine new buildings, under most discouraging conditions of high labor costs, strikes, official dishonesty, financial burdens and innumerable impediments. With what has already been accomplished and another five years of work San Francisco, he believes, will be a greater city than it was previous to the earthquake and fire of April 18, 1906. Mr. Fleming is well equipped to make comparisons, as he was in the city in the week after the catastrophe and again two years later. In his opinion San Franciscans are entitled to great credit for the superb courage and nerve displayed in the face of great obstacles. He was also impressed with the progress of Seattle, which has doubled its population in 10 years. Portland, Los Angeles, San Diego and Salt Lake City also reflect great advances in business prosperity, and in a general way these observations apply to the whole section west of the Rockies. As Mr. Fleming was accompanied by his wife he supplemented the business part of the trip by visits to the Grand Canyon of the Colorado and Yellowstone Park.

J. H. Williams & Co.'s New Catalogue.

J. H. WILLIAMS & CO., 150 Hamilton avenue, Brooklyn, N. Y., have just issued a catalogue of 120 pages, fourteenth edition, May, 1909, illustrating stock products, including 40 pages of Drop Forged Wrenches, various kinds of General Forgings, Chain Pipe Wrenches, &c., in addition to any kind of Drop Forgings to order from iron, steel, copper, bronze and aluminum. New goods embrace Vulcan Bijaw Chain Pipe Wrenches, Agrippa Fittings, Chain Wrenches, Planer Clamps, Lathe Dogs, with two screws, Flat Handle S Wrenches and Wrench Sets in canvas rolls. Several pages are devoted to analytical and physical steel specifications, with illustrations. Liberal provision has been made for the gratuitous distribution to employees of shops, &c., of a 4 x 6 in. pocket edition. The front cover design is the facsimile of a red hot Drop Forged Wrench.

The Brownsville Hardware Company, Brownsville, Texas, is using the emblem reproduced herewith, which



appears conspicuously in all of its stationery, the letter B being printed in red. It is also used in the form of a sticker on all the company's A1 goods. While the mark has only been in use for the past three or four months, we understand that it has attracted a good deal of attention from the company's customers,

and it is believed that in time it will be of some benefit in pushing lines of recognized merit and standing handled by the company.

M. A. Loeb, secretary of the Rock Island Battery Company, Cincinnati, Ohio, has returned from an extended trip to the Pacific Coast, after establishing branch supply depots at both Seattle, Wash., and San Francisco, Cal., for the company's Dry Cells. The company refers to the number of orders now in hand as larger than ever before in its history.

The Schafer Hardware Company, Decatur, Ind., has been incorporated, with \$25,000 capital. The directors are Fred Schafer, Chalmers C. Schafer, John B. Miehers, A. D. Artman and A. W. Gruber.

CONTENTS.

	PAGE
The Wood Turret Machine Company's Plant. Illustrated.	87
Contracts Placed for the Jones & Laughlin Tin Plate Plant	88
The Lunkenheimer Oil-Air Cock. Illustrated.	89
Poor's Manual for 1909.	89
Notes on Tests of Ingots. Illustrated.	90
The National Multiple Spindle Drill. Illustrated.	93
American Shipbuilding in the Fiscal Year 1909.	93
Compulsory Factory Ventilation.	94
Alloy Steels for Motor Car Construction.	95
The Enterprise Multiple Strainer. Illustrated.	95
The American Society for Testing Materials.	96
An Interesting Fox Miller Job. Illustrated.	104
A Heavy Oil Power Press. Illustrated.	105
The Metal Schedule as Revised by the Senate.	106
Rolling Mill Motors.	111
A Barnes Heavy Duty 22½-In. Gang Drill. Illustrated.	112
The Golden Cushioned Triple-Acting Nonreturn Valve. Illus.	113
A Crucible Steel Furnace Record.	113
The Panama Canal—II. Illustrated.	114
Experiments on the Case-Hardening of Steel by Gases.	120
Copyright in Drawings of a Technical Character.	122
An Interesting Driving Axle Failure. Illustrated.	123
The Allegheny Steel Company Buys the Reliance Tube Company	123
Editorial:	
How the Ironmaster Has Promoted Peace.	124
Some Results of a Premium System.	125
The American Automobile Output for 1910.	125
Correspondence. Illustrated.	126
The Reorganization of Milliken Brothers, Inc.	127
The American Institute of Chemical Engineers' Meeting.	127
Cyclone Special Steel Tests.	127
Rolling Mill Discussions by Electrical Engineers.	128
Electric Driven Rolling Mills.	129
An Important Pennsylvania Railroad Improvement.	130
May Iron and Steel Exports and Imports.	131
Personal.	131
Brazilian Ore Deposits Extraordinary.	131
The American Car & Foundry Company.	132
The Tariff Bill's Progress Through the Senate.	133
Customs Decisions.	133
Pig Iron Production.	134
News of the Works:	
Iron and Steel.	135
General Machinery.	135
Foundries.	135
Power Plant Equipment.	135
Fires.	135
Hardware.	135
Miscellaneous.	136
Trade Publications.	136
The Iron and Metal Trades:	
A Comparison of Prices.	137
Prices of Finished Iron and Steel, f.o.b. Pittsburgh.	137
Chicago.	138
Birmingham.	139
Philadelphia.	140
Cincinnati.	140
Cleveland.	141
Pittsburgh.	142
Buffalo.	143
New York.	144
Metal Market.	144
Iron and Industrial Stocks.	145
Canada's Bounty Showing in 1908-9.	145
Labor Notes.	145
The Sheet and Tin Plate Situation.	146
Obituary.	146
The Machinery Trade:	
New York Machinery Market.	147
Chicago Machinery Market.	147
Philadelphia Machinery Market.	148
Cincinnati Machinery Market.	148
Milwaukee Machinery Market.	149
Cleveland Machinery Market.	149
New England Machinery Market.	150
Government Purchases.	150
The American Steel & Wire Company's Pension List.	151
The Heaviest Freight Train Ever Hauled by One Locomotive	151
Hardware:	
Condition of Trade.	152
Notes on Prices. Illustrated.	153
New Method of Invoicing Stock. Illustrated.	155
A Dallas Motto. Illustrated.	155
Pacific Coast Progress.	156
J. H. Williams & Co.'s New Catalogue.	156
Making Good in Business.	157
The Question Box.	158
Southern California Window Displays. Illustrated.	159
Hardware Trade with the Philippine Islands.	160
Demonstrating New Goods and Specialties.	161
Carolinas' Hardware Convention.	162
Hardware Accounting.	162
Straightening Crooked Handles for Axes, Sledges, Tools and Mails. Illustrated.	163
Requests for Catalogues, &c.	163
Price-Lists, Circulars, &c.	163
Among the Hardware Trade.	163
John Wilson's Butcher Knives.	164
The Badger Coaster Wagon.	164
Universal Alcohol Stoves. Illustrated.	164
The A. A. Automatic Kitchen No. 2. Illustrated.	164
Ambicut Razor Hones. Illustrated.	165
The Princess Automatic Washing and Wringing Machine. Illustrated.	165
The Twentieth Century Mail Box, No. 4. Illustrated.	165
Richards Good Sense Grass Catcher. Illustrated.	166
The E-Z-Way Hanger. Illustrated.	166
Rlix's Architects' and Engineers' Rule. Illustrated.	166
The Keenoh Automatic Razor Sharpener. Illustrated.	167
Current Hardware Prices.	168



Contemplation and Action.

In this theatre of man's life contemplation and action ought ever to be united, a conjunction like unto that of the two highest planets—Saturn, the planet of rest, and Jupiter, the planet of action.—Bacon.

The Lack of Imagination and Initiative.

We will say his name was Mills, and he was one of the army of workers in the service of a wholesale clothing house. He came to me with his serious problem: he had been employed by this house for three years; he had received one small raise of salary at the end of the first year, and now, after two years of waiting, he was side tracked, as he thought, hopelessly stalled on the road to business success, one of the innumerable teeth in the mighty gear, of no special value, and with no prospects whatever for the future. He wanted to marry (on \$6 a week), and this had added to his discontent with his surroundings. He came to ask me whether he had not better give up his situation, and trust to luck to find something better. I urged at once against such a course, and told him to look for something better while still holding his present situation. He said he had tried that for some time, but found himself restless. I said to him, "Mills, the important thing for you in this matter is to ascertain whether you are paid all that you are worth; and, that settled, whether you can make yourself worth any more. But first of all let us see if you can make yourself worth any more, whether you are paid it or not. If you can, you had better stick and look for your raise at the first fair opportunity." He agreed with me in my hypothesis, but said he did not quite understand how that could be found out. I said, "I cannot find it out to-day, but if you will put yourself in my hands absolutely for three months, I will guarantee that we shall both have an answer to that question." He agreed, and I went ahead. Here were my instructions to him:

His Problem.

"For the first 30 days I want you to put your mind on one thing only; drop all outside nonsense and focus your entire attention, thought and energy upon this question: By what method which *you* can devise, can your house sell \$100,000 worth more of goods every year than they are now selling? (Mills gasped!) Or \$10,000 worth more? Or \$1000 worth more? Or \$100 worth more? When you have discovered your plan, work it all out on paper, put down the figures in black and white, verify every item of expense, and take the complete showing at a favorable moment to the man on whom you must depend for your raise of salary. However good the idea may be, when you present it to him view it tentatively; tell him as modestly as you can that you believe that the prosperity of the house should be as truly your concern as his; that both your fortunes are in the same boat; say frankly that you hope it may not seem presumptuous that you should seem to suggest reforms or changes, but that you are really interested in the success of the business, and it is this interest which must be blamed for any seeming intrusion on your part. Put it to him modestly; if he decides that the idea is not good, say you are sorry for having wasted his time, and get out as quickly as you can. Then go to work on another idea. When you carry this to him, if he negatives it also, make

The First Proposition.

your excuses and ask him if there is any objection to your still studying and trying to plan out some method by which the business can be extended." In a general way, with a good deal more of explanation, I think I made him understand how he was to present his idea, so that in no case would he be in danger of losing his position or the good will of the firm, by seeming to have their interests very closely at heart.

Thirty days passed, and Mills came to me. His report was brief. With all his thinking, he had found no method by which the business of the firm could be extended even \$100 a year. I then put him to work upon his second month's labor, which was this: "See whether you can discover any method by which, while losing no present advantage or trade, the firm can transact its present volume of business with greater economy, so that, by your improved methods of conducting the business, there shall be effected a saving of \$50,000 a year; or \$5000 a year; or \$500 a year; or \$50 a year!"

Recommendation Number Two.

I thought he drew a rather long breath as he left me to go to work for 30 days on this proposition; but he, more or less manfully, went through the second stage of his labors, and at the end of another 30 days he came back to me with his report. He had been able to discover no new method whereby the firm could economize on its present system. He had, however, discovered one thing, namely, that he would not need to go ahead for another 30 days with our experiment, for he had about made up his mind that he would continue where he was.

I said to him, "So, Mills, you don't care for any more of my advice? Well, this time I am going to give it to you, without your wanting it. My boy, just realize for one moment where you stand. With the enormous volume of clothing business which is being done, and with the undoubted expansion which can be effected, you are not able, though you have worked three years in this house, to increase the volume of this business \$100 a year; with the elaborate and necessarily wasteful methods in which that great business is transacted, you are not near enough to it to be able to point out a better system in any department whereby the small sum of \$50 a year may be saved.

The Last Word.

Now, Mills, let me give you a last word of advice, and it is valuable advice. My boy, lie low! Attract just as little attention to yourself as you can. Don't let the proprietors or manager remember that you have been three years in their employ, if you can help it. You are an absolutely unproductive man. If they knew how little capable you are of development and progress, they would change you off to-morrow for some young man of greater promise. Lie low, my boy. Keep out of prominence as much as you can, and go down on your knees to-night and thank God that you have got a situation where you are paid all that you are worth. I don't mean that you are a bit inferior to thousands of other young men who are in the stores and wholesale houses in this city; but you, like them, are simply sitting upon the head of the one brainy man who sits in the counting room. He has to solve all these problems. You and 50 others in your establishment are just sitting on top of his head, like so many dead weights. If the business prospers you expect a raise of salary, when it is his head-work that has gained every inch of the progress. He has to carry you all."

The young man went off, sadder and wiser than he came. For the five years thereafter in which I was able to follow his course, he held the same place and at the same salary. Now, in a last word, what was the object of this experiment? Of course, I didn't expect that this boy was going to revolutionize the clothing trade. It was simply to find out whether he had in him any imagination which he could employ in his business. I was willing to stake my prediction of his fate on the result of that one question, and I think the years have shown that I was right.—LORIN F. DELAND in the *Atlantic Monthly*.

J. W. Cavanagh will erect a new building in Kent, Wash., in which he will conduct a Hardware and Furniture business.

THE QUESTION BOX

This department is open for the discussion of questions which arise in the practical conduct of the Hardware business. Our readers are invited to contribute, submitting inquiries or answering questions.

Correspondents are expected to give their names and addresses, but in order to encourage frank expressions of opinion the advice of our correspondents will be treated in confidence, names and addresses not being published.

For convenience, Questions or Answers should be addressed to THE IRON AGE QUESTION BOX, 14-16 PARK PLACE, NEW YORK.

List Prices on Window Glass.

What quality of Window Glass, 28 x 32 in., is listed at \$56 per box, and is this jobbers' or manufacturers' list?

For the information of our correspondent and the trade in general we give in connection with our report on the Window Glass market under "Notes on Prices" on another page, both the manufacturers' list and the jobbers' list. By referring to these it will be seen that the Glass described by our correspondent is in the "70 United Inches Bracket," and is Double Strength A quality. In the jobbers' list the list price is \$56, while in the manufacturers' list it is \$42.

The Term Catty.

What is the meaning of "catty" as applied to packages of Fishing Tackle?

The term "catty" was brought to our correspondent's attention recently in connection with quotations on Fishing Lines, the box or wrapping enclosing the goods being incidentally referred to as a catty. Catty indicates approximately a pound weight and is used to represent the Chinese kin or pound. The value of the catty was fixed by the East India Company in 1770 at 1 1/3 lb. avoirdupois. The usual Chinese kin is 1.325 lb.; the weight fixed by the Chinese custom house in 1858 is 1.3316 lb., and that of the Royal Mint at Peking at 1.348 lb. The term is also applied in different localities to slightly different weights. The word caddy, as in the familiar tea caddy, is a corruption of catty and originally was a box containing a catty of tea for exportation. The term catty or caddy thus came to denote a small package of tea less than a chest or half chest, and then the box in which the tea is contained.

Uniform Size of Invoices, Statements, Etc.

We have received a number of replies to the suggestion published some time ago that it would be very convenient if invoices, statements, &c., could be of some uniform size, thus facilitating filing. Many of our correspondents express themselves as favoring the suggestion without going into the question whether or not it is practicable to secure such uniformity. Several Hardware merchants, however, while admitting that theoretically the proposed change would be an improvement, recognize that it is quite out of the question to realize it. One merchant, for example, in North Dakota, suggests to the gentleman from Texas who propounded the query "that he is asking too much, and we might as well suggest that all invoices and letter heads of jobbers and retail dealers should be of the same size."

This inquiry brings up the old question as to the adoption of a uniform size or certain standard uniform sizes for catalogues and price-lists. This, however, is evidently impracticable in view of the different requirements of

the various manufacturers. There certainly is as yet no approach to anything like a standard, as Hardware catalogues continue to be characterized by great diversity of size and shape. There is this diversity because each manufacturer and jobber adopts that style of catalogue which, all things considered, best serves his purposes. The convenience of the retail trade is only one of the many things which must be taken into account.

Manufacturers' Catalogues for Retail Merchants.

Enterprising retail merchants who give careful attention to the care of manufacturers' catalogues are embarrassed by the number of such catalogues and also by the fact that the catalogues of manufacturers with whom they deal contain in many cases a large amount of matter which is of no practical use to them because relating to goods which they do not handle. With a view to meeting this condition an enterprising house in Illinois suggests that the loose leaf system be applied by manufacturers in issuing their printed matter for retail merchants, so that each merchant can have such price-lists conveniently filed as are all of use to him. On this subject our correspondents say:

FROM AN ILLINOIS MERCHANT: If all the manufacturers would adopt a standard size catalogue so they could furnish the Hardware dealers with extra pages, even if they charge for them, it would be the greatest thing for the Hardware trade of anything we know of. The idea would be if all the pages were standard size a man could get a loose leaf binding and punch the pages to fit any style of loose leaf binding he might adopt, and every Hardwareman could make up a catalogue selecting the goods which he handled. This would be a splendid thing for the retailers and small jobbers, and cannot see any disadvantages it would be to the manufacturer.

Co-operative Buying.

The letter given below is of special interest, coming as it does from a merchant who has had experience in a successful movement of this character. It will be observed that emphasis is laid on the importance of having at the helm of such a buying organization men who can command the respect and confidence of the members.

FROM A PENNSYLVANIA MERCHANT: The first requisite for a successful co-operative buying organization is that one or more men should be found who can command the respect and confidence of others, who are willing to make sacrifices and who are not easily discouraged. Co-operative buying, as it is generally tried without a warehouse and without carrying stock, has been and is a hopeless failure. It cannot be otherwise. The men who are handling the business get tired of the work and of the criticism to which they are certain to be subjected. Furthermore, it is next to impossible to have a number of men buying in this way with no money invested, without having misunderstandings and suspicion arise, and the upshot of the whole business must be for the men doing the work to throw up the sponge. Co-operative buying can only be successful through the efforts of men who can lead the others step by step, demonstrating their practical knowledge by what they do and showing actual results. Only in this way will the others follow and be willing to back up what the active men do.

W. J. Smith & Son have succeeded to the Hardware Stove, Implement, Paint and Sporting Goods business of Peterson & Smith.

C. O. Page & Co., Wichita, Kan., have disposed of their Hardware, Stove and Sporting Goods business to Yungmeyer Hardware Company.

The Hardware, Stove, Paint and Sporting Goods business of D. H. Butler, Columbiaville, Mich., has been bought by E. W. McGunegle.

Henry Payne has purchased the Hardware, Stove, Implement, Paint and Housefurnishing business of J. P. Sullivan, Niles, Kan.

Southern California Window Displays.

Household Articles, Cutlery and Tools Shown to Good Advantage.

RECENT displays in twin windows of the San Bernardino Hardware Company, San Bernardino, Cal., are shown in the accompanying illustrations. In Fig. 1 the arrangement of posts and arches covered with white cotton batting made natural divisions for the various kinds of goods displayed. On each post is an electric light under a globe. The back and floor of the window is covered with red canton flannel, which contrasts admirably with the brighter surfaces of the goods. The panel to the right was devoted to Aluminum Ware, which is always attractive to the ladies. The center one was arranged with Ladles, Graters, Butcher Knives and various other kitchen utensils. In the left hand division were Egg Whips, Mixing Spoons, Nickel Trays, Pudding and Jelly Molds, &c. On the floor of the window were Tinware, Roasting Pans, Scales, &c. In the foreground, on a plate glass shelf, supported on nickel plated standards, were shown Silver Plated Spoons and Forks, Clocks, &c. The window was harmonious in detail, well balanced and not overcrowded.

The company always keeps one of its windows trimmed with Tools, as they are considered the most profitable line to handle, while it impresses the public

him, and he will generally see some article which he feels he ought to have to supplement his own meager collection. When a man feels that he "must," he is as dough in the hands of an intelligent salesman. The Tool window, shown in Fig. 2, had a background of red canton flannel, and its arrangement is worthy of examination in detail. The goods show so distinctly in the illustration that an enumeration is not necessary to a clear comprehension of the arrangement and class of goods exhibited.

The windows are each 15 ft. long, 8 ft. high and 4 ft.

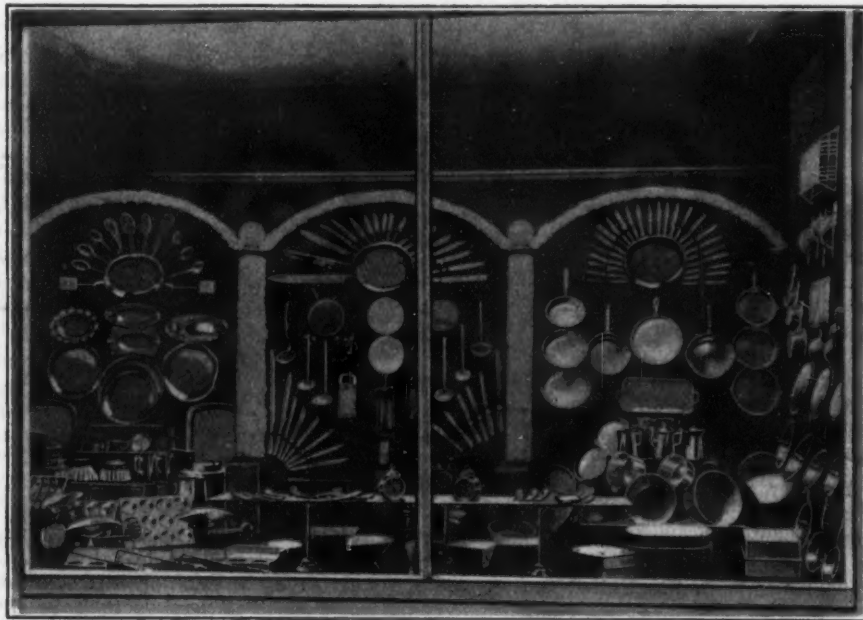


Fig. 1.—Aluminum and Tin Ware, Cutlery, Household and Kitchen Utensils, with Background of Red Canton Flannel.

deep, and were arranged by Charles Marsden, an employee of the company.

L. N. Bessette of the Bessette Hardware Company, Saratoga, N. Y., has rented a store for a term of years in Bennington, Vt., and will move his entire stock and

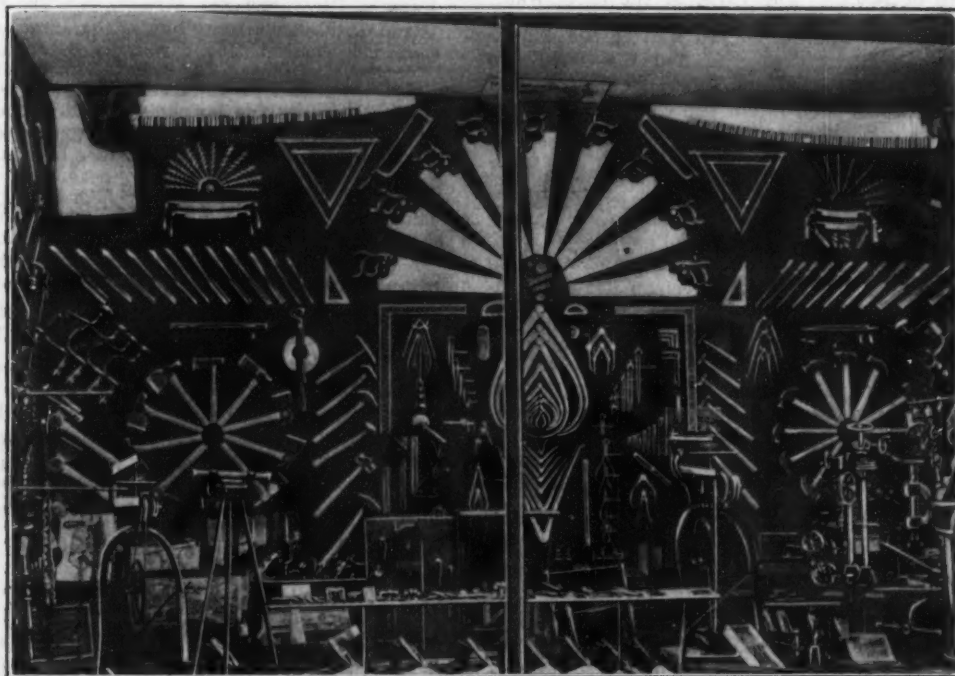


Fig. 2.—A Symmetrically Arranged Window of Tools, Attractive to All Classes of People.

with the idea of the store being up to date in the Tool line. There is a fascination, in a window full of Tools shown to good advantage, to the average man, whether he can drive a nail straight or not. The display appeals to

fixtures from Saratoga to that place. The store will be remodeled and a 40-ft. addition built at the rear. The goods handled will include General Hardware and Building Supplies.

Hardware Trade with the Philippine Islands.

American Exports Negligible—Manila Main Entry Port—Chinese Go-Downs—Outer Display Ignored—Adherence to Accepted Custom—Chinamen in Philippines and China Contrasted—Foreign Merchants' Contempt for Chinese Competitors.

THE only method of arriving at an approximate estimate of the value of our Hardware trade with the Philippine Islands is that offered by the official statistics of the Bureau of Commerce and Labor, according to which the total exportation of American Hardware and Tools to our Philippine possessions during the year 1908 did not exceed \$175,000.

If it were possible to obtain an itemized statement of the various lines grouped under this single heading, it would prove interesting, not alone to manufacturers who are directly interested in the trade, but to the Hardware world in general, as indicating the progress that has been made in the islands since we began the work of colonization. For the rise or fall in the sale of Hardware and Tools is an effective barometer in the march of civilization, and records as closely as any other condition the rate of advance in modern activities.

Greater Effort Necessary.

It would be conservative to estimate that of the \$175,000 worth of Hardware and Tools exported to the Philippines during 1908, one-half was sold by the local dealers to the Insular Government, which buys emergency supplies from the Manila merchants in preference to awaiting the receipt of goods purchased through its official agents in the United States. This would leave less than \$100,000 to be distributed among the eight odd millions of inhabitants scattered throughout the islands.

Nor was 1908 an exceptionally dull year, since the figures show an increase over those of previous years. It therefore follows that, in spite of our painstaking efforts to impress upon our little yellow brothers the advantages of American Government and American commerce, we sell to them so little Hardware that the gross sales are hardly worthy of a place in the statistics.

Manila the Chief Market.

For the small amount of goods that finds its way to the Philippines, Manila is the principal, and practically the only market. In Manila, 10 years after the American invasion, one might expect to find the Hardware business largely in the hands of American dealers, but with a few exceptions such is not the case. The Chinamen have proved difficult to dislodge as vendors of Hardware, and in one instance a Chinese firm enjoys probably a larger turnover than any two American firms.

In one year, 1904, this particular Chinese firm delivered to the Insular Government goods in excess of \$75,000, mainly because it carried a large stock and was able to make prompt deliveries. The American dealers complain bitterly of the competition of these merchants, for their establishments are hardly worthy of the dignity of stores, but they live cheaply and are satisfied with a smaller rate of profit, and, what is equally important, they seem to have the necessary capital for carrying liberal stocks.

Chinese Hardware Establishments.

The Chinese Hardware establishment in Manila is a store only by courtesy. It consists usually of a small booth opening on the street, with few wares in sight. The bulk of the stock is kept in "go-downs" in various parts of the city, preferably within easy reach. These are strictly Hardware stores. In addition there are a number of bazaars that sell household articles of all kinds, dry goods and clothing, and combine with business a Hardware department. Whether the bazaars are patterned on the line of our department stores, or whether the department store idea originated in the Far East is not a matter of record, but doubtless the Philippine bazaar was first introduced by foreigners under the name "General Storekeeper."

At any rate, the bazaars apparently do a large business, and are a further thorn in the side of the American who attempts to conduct a modern Hardware store. The bazaar might even be classed as a 5 or 10 cent store, were it not for the fact that occasional articles exceed this price. In general, however, the goods are cheap, and the class

of Hardware that is stocked coincides harmoniously with the purchasing power of the average Filipino. The cheapest goods of England, Germany and France are most frequently displayed.

Outward Appearances No Criterion.

The unprepossessing front of the Chinese Hardware shop may not be taken by the salesman with a line to market as an indication of the amount of business to be done, provided his line is at all within the reach of the public. Nor should his reception by the indifferent "Chink," who greets his entrance, influence him to depart before he has exhausted every expression in the limited vocabulary of the proprietor.

He may be left a score of times in the midst of his efforts to explain his mission, by the proprietor who is zealous to ascertain the wants of each and every customer that interrupts. Time has little value in the land of the "Siesta," and patience will be rewarded by some kind of a hearing.

Chinese Idiosyncracies.

To persuade the average Chinese dealer to visit a sample room for the purpose of inspecting samples, however, is a different matter. He is rarely interested in new goods unless they are cheap, and he will make frequent appointments which he invariably fails to keep. If persistently requested on an average of once or twice daily, he will eventually don his street clothes and call.

Chinese in Philippines Differ from Chinese at Home.

In buying goods from white men, the Chinese of the Philippines differ from their countrymen of Hong Kong and Shanghai. In the latter cities they are accustomed to rely largely on the fairness of the white merchants and salesmen by giving verbal orders and paying for the goods on their usual terms without keeping an exact record of the prices originally quoted. The Hong Kong and Shanghai importers are, for the most part, British houses.

Whether the Filipino-Chinese have learned from experience not to place too much trust in white men or whether the trait is one gathered from long association with the Filipinos is not known, but the Chinese Hardware dealer of Manila will insist upon seeing an exact copy of his order and will closely scrutinize every price and condition before confirming it. The natural impression gained from this characteristic, so totally different from the customary trustfulness of the dealers of Chinese cities, is that our methods of colonization in the Philippines have fallen short of the standard set by the British in their relations with Eastern nations.

On the other hand, it might also be claimed that the type of Chinese merchant to be found in Manila differs from that of Chinese cities, and that the necessity for caution exists on both sides of the transaction. It is not always easy for the casual observer to learn the true cause of conditions, especially where Orientals are concerned.

Looked Upon with Fine Scorn.

Even to the stranger, however, it is noticeable that the foreign Hardware dealers look down with fine scorn upon their Chinese competitors. Those who sell to them are regarded much as scabs are regarded by union men. The European merchants who solicit the Chinese trade are apt to get a reputation among the American houses as disturbers of trade.

But the Chinese dealers go about their business, serenely unconscious of the disapproval of their competitors and quite ready to take care of any business that may come within their reach. To Uncle Sam's Government it is largely immaterial whether his orders go to

Hop Sing or Ying Lu, provided the price is reasonable and the goods are satisfactory.

Under these conditions it may be seen that the conducting of a modern American Hardware store among the Filipinos is not the easiest or most lucrative occupation, and that the opportunities for investing new capital in this particular branch of business are not attractive. This explains in large part the low figures of exports of American Hardware to the Philippines.

Demonstrating New Goods and Specialties.

A Manufacturer Explains Why He Is Looking for Other Mediums of Distribution Than the Jobbers.

To the Editor: A reader cannot pick up a single trade journal devoted to Hardware interests these days without finding page after page of catalogue house trade information, promulgating the ideas of an army of fighters. The jobbers are not saying much, "just sawing wood," but they are sawing into a knot without knowing it, and it will take a little grease before they get through it if they do not wake up. They laugh and smile and—and saw, while the dealers get after the catalogue house and the manufacturer. What else do the jobbers do? They have an army of travelers carrying their catalogues, picking up the dealers' orders from his want book. At least that is what a large per cent. of them are doing, and the jobbers encourage their men to do nothing else (speaking generally, of course,) because when a manufacturer calls on them with new goods or good goods that are being neglected they tell the manufacturer, "Make a demand for your goods and we will catalogue them," or, "We give your goods a prominent place in our catalogue; we cannot do any more than that."

Of course, they cannot buy everybody's product, but they can pick winners and it is up to the manufacturer to build it right, and most of them realize that importance. So the manufacturer spends a lot of money advertising, then he gets a good quantity of small orders from dealers and large requests from catalogue houses. Now and then a jobber nibbles slightly. After awhile he goes to see those jobbers who have bought enough to make a "try out," reasonably expecting a good volume of business. He approaches a buyer with confidence, saying, "Has my line made good with you?" Without any special interest the buyer says, "I hardly know yet; we

have catalogued the goods; we are not making any other push on them; the fact is our salesmen have a thousand and one things in their catalogue and they cannot give any one thing special attention; sorry we cannot do anything for you to-day." "Well, but you bought a little bill of these goods lately; that certainly ought to give you an idea of their selling possibilities by this time. Is not the profit worth while to you? Can you suggest something whereby we might arouse your interest more effectually? We make them well; we stand behind them; there is almost unlimited sale in prospect and almost no competition; hardly a dealer but will buy if shown the goods. You can get the cream in your territory if you now demonstrate them by samples, for most of the trade have heard of them by our advertising."

"My dear sir, you see we have catalogued them, and our travelers will not carry samples, or, if we ask them, they may carry them over the territory, but mostly leave them at the hotel. I do not see as we can do any more for you than we are doing; good-day!"

The manufacturer retires, things look gloomy, and his enthusiasm is a little depressed. On the train for home he strikes up an acquaintance with his seat mate (who is probably a traveling man), and he asks: "What is your line?" He answers, "I've not much of a line; I have a sample in my pocket," and proceeds to show it. Other passengers crane their necks; finally quite a number of strangers have gathered around, ask to see it;

A Ray of Sunshine.

a good many interesting remarks are heard; some had never seen such an article before; others are delighted with it. "Where can I get one of those?" &c. "Gee! but I'd like to get that as a 'side line,' says the salesman." A lot of other things are said, all of which puts a little sunshine into the manufacturer's day, after all. He does not think much of the "side line" proposition, though, for he is an employer of salesmen himself, thinks it not fair to an employer who pays a salary, besides does not think much of "side lines." But he is beginning to find himself; a little of his fighting spirit is coming back; he begins to think jobbers as a class are no good,

Catalogue Houses Want the Goods.

that many of them are in the dilettante class, anyhow. On his arrival home he finds a lot of special mail on his desk awaiting his final judgment, including several orders from catalogue houses. Does he turn them down? Well, human nature is weak; but sometimes a brave man is born, and he is a fighter; you cannot always tell which way a cat will jump by looking at it. He may fight the jobber through the catalogue house; you never can tell. The orders are a temptation whichever way you look at them. The manufacturer is the dealer's best friend. He's got to be, for somehow the dealers will make the final market for his goods; the manufacturer cannot get along without them. How about his jobber? A manufacturer may be forced to sell

Other Mediums.

direct to the dealer or some of the wholesale grocery houses that carry a line of Hardware; the wholesale paper houses that go in for Wooden Ware and Specialties—perhaps household outfitting houses that sell on credit and employ canvassers; department stores, or perhaps machinery supply houses. There is an infinite number of ways, and they are all clipping the wings of the jobber. There are to-day a number of good openings in our large Western cities, because of the indifference of jobbers in sampling the attractive goods they buy. In some places these new houses have already started; they have their travelers hired especially for demonstrating new goods and specialties. They send them out over the same territory, about two weeks behind each other, and so the trade is kept in touch with the same house every two weeks, each one demonstrating a different specialty, at the same time picking up the orders on the want book. Perhaps the same manufacturer has other attractive goods that may be patented specialties; they have been on the market for years; sales are fine (in spots). He wonders why a small jobber in territory completely surrounded by large jobbers can have a phenomenal trade in them, and the large jobber hardly anything to speak

Demonstrating Travelers.

of, the law of proportion being entirely out of sight. His recent conversation with the buyer runs through his mind, but it strikes him that all jobbers are in business to sell goods—that is what they organized for—whether large or small. Why is it, then, that a large jobber is so satisfied to let the smaller houses crowd him down in the special lines where the real profit is and not realize the vast volume of sales that go with attractive specialties when pushed? Philanthropy to competitors has not yet become prominent enough to be noticed! Apparently they do not realize that to worry a dealer through the old staples until they have all the orders on the want book, that he is too tired to take any interest in specialties; that good demonstration of attractive specialties at the beginning will

Small versus Large Jobber.

brighten up the dealer, enthrall him along growing lines, and get the staple orders off the want book just the same. Not only that, the specialties call for frequent orders—mail orders—sometimes not enough weight for a freight shipment, which induces the dealer to add enough of something else to make it worth while—all to the benefit of the alert jobber.

Query: What is the difference between a jobbing house and a catalogue house? One sends its catalogues out by mail and the other mails its catalogues. The rambling thoughts (?) of an

OLD MANUFACTURER.

The Carolinas Hardware Convention.

(By Telegraph.)

ASHEVILLE, N. C., July 7, 1909.

THE Retail Hardware Association of the Carolinas is holding its fifth annual convention under very favorable auspices. The past year has been a remarkably prosperous one. Besides a substantial gain in membership the officers have succeeded in putting the association into excellent financial shape, with all indebtedness discharged, a good balance in the treasury and an easy outlook for the future. In connection with the meetings the exhibit feature is more emphasized than at any former convention, with a greater number of exhibits, many of which are most artistically displayed.

One great advantage of the arrangement is that everything is within the compass of the Battery Park Hotel, so that all the interests of the convention are there centered. The meetings are held in the auditorium, which is practically a separate building, though connected with the hotel. All the space around the walls in this room is occupied with exhibits, leaving the middle of the room available for seats, which are used during the sessions of the convention. These displays thus make an attractive setting for the deliberations of the association. The afternoons as a rule will be given up to the examination of the exhibits and such special features of interest as may arise.

Tuesday's Sessions.

The opening session was attended on Tuesday morning and was frequently referred to as the most interesting and most successful in the history of the organization. After an invocation by Rev. J. S. Williams of Asheville, an official welcome to the city was extended by Hon. W. J. Cocke, to which responses were made most felicitously by President Duvall, who spoke on behalf of the members of the association, and by M. C. Thompson, on behalf of the associate members. R. R. Williams, hardware editor of *The Iron Age*, and H. M. Owsley, representing the Norvell-Shapleigh Hardware Company, St. Louis, at the call of the president, also addressed the convention. After the appointment of committees the morning session closed.

A brief session was held in the afternoon, when a short but interesting address was made by W. S. Hall, Gaffney, S. C., on "Collection of Debts by Law." Valuable suggestions were made, notwithstanding the cursory treatment of the subject, which was necessary because the speaker was called out of the city by an early train. An interesting address followed by A. L. Phipps, Durham, N. C., on "What Can Be Accomplished by United Effort, Especially in the Various Communities in Which Merchants Reside." The remainder of the afternoon was given up to the exhibits and informal contact of merchants and manufacturers.

THE HENDERSON & BAIRD HARDWARE COMPANY, Greenwood, Miss., has been organized, succeeding the Mann Hardware Company and Henderson & Baird, whose business interests have been acquired. The officers of the new company are A. Henderson, president; J. E. Mann, vice-president; T. H. Baird, manager, and J. H. Freeman, secretary and treasurer. The company will handle an extensive line of general Hardware, Implements and Vehicles. Three traveling salesmen will be employed. The business of the new company will be largely wholesale, although retailing will also be carried on.

JOHN WATSON & Co., Houlton, Maine, have added Mill Supplies to their jobbing lines of Hardware and Farm Machinery. The department is in charge of Arthur G. C. Page, formerly with the Fairbanks Company.

Hardware Accounting.

To the Editor: I read with much interest the article some time since in which you described the bookkeeping methods of a New York State Hardware merchant. The system certainly contains some original features of excellence, which will doubtless be studied with interest and profit by many brother merchants who are seeking to improve their methods, and are on the lookout for new and practical ideas along this line.

Education and Progress Sorely Needed.

I venture to express the hope that we may have more articles dealing with bookkeeping methods and problems, for I believe that there is no department of business management in which education and progress are so sorely needed by the Hardware fraternity. There are many to interest themselves in a merchant's methods of store arrangement, displaying samples, dressing windows and cultivating trade. It is no reproach on the manufacturer, jobber or salesman to suggest that his enthusiasm along such lines is not entirely disinterested, since he may be the gainer from the retailer's increased efficiency in any of these branches. The fact remains, however, that little or nothing is heard in trade circles, or read in trade papers, or even discussed on Hardware convention floors relative to the accounting department, although the opportunity for advancement in this direction is only too apparent to all who have financial dealings with any considerable number of retail Hardware houses.

Requirements of an Adequate Bookkeeping System.

In considering a bookkeeping system, there are several requirements of importance which must be kept in mind. Primarily, it must of course provide an accurate and complete record of all dealings conducted on the credit basis, whether with customers of the firm or with those of whom the firm is a customer. A fact sometimes lost sight of is that such records should be close enough to the established standards and usages of the business world to make them intelligible to correspondents of the firm without troublesome explanations or arguments. A second requirement of a bookkeeping system is a complete cash record covering all the receipts and disbursements of the business.

A Running Analysis of His Business.

It is, perhaps, not unusual to find these two necessities fairly well satisfied in the bookkeeping methods of Hardware retailers. There is, however, a third requirement which I believe is very generally slighted, if not entirely lost sight of, by many merchants. I refer to that branch of bookkeeping which is more accurately styled accounting, and which affords a merchant a running analysis of his business, keeping him constantly in touch with all departments, enabling him to tell where he is making and where he is losing, where there is progress or the opposite, where there are leaks that should be stopped and where a more liberal policy would show enlarged profits. With an intelligent accounting system a merchant has all this knowledge at his command, and can tell at any time the condition of his business as a whole; without it he blunders along in the dark, making some money, perhaps, but not knowing just how and certainly not making as much as he might if he would adopt methods insuring himself the grasp and thorough understanding necessary to the most successful management.

In Hardware accounting there is a great opportunity for education and progress, and I hope to read more about it in *The Iron Age*.

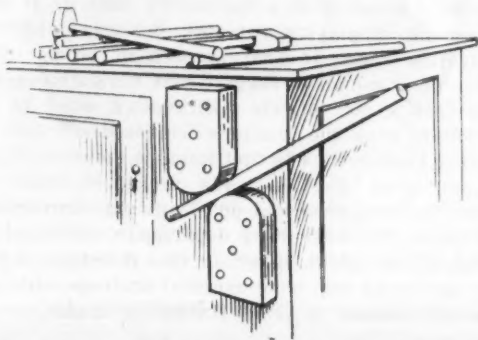
NEW ENGLAND.

THE INDIANA BENT RUNG LADDER COMPANY, Indiana, Pa., is making preparations to engage in the manufacture of Folding Camp Furniture, and expects to have this line ready for the market early in July.

FRANK P. TENNEY, who represents Smith & Hemenway Company, New York City, sailed July 3 on the Hamburg-American liner Kaiserin Auguste Victoria for Europe.

Straightening Crooked Handles for Axes, Sledges, Tools and Mauls.

AMONG the subjects which came up for discussion at the convention of the South Dakota Retail Hardware Association, held last March, was how and where Axe Handles should be kept to prevent them becoming crooked. It was declared that Axe Handles were almost a profitless stock, owing to the deterioration caused by changes in shape. J. E. Forbes, traveling salesman, Ottawa, Kan., having noticed the reference to this matter in the report of the meeting given in *The Iron Age*, submits for the consideration of the trade a method which he says has been in use for six years and proved a practical method for straightening crooked Axe, Sledge, Tool and Maul Handles, the process not requiring over a quarter of a minute per handle. The accom-



Handle Straightening Blocks for Making Salable Crooked Axe, Sledge, Tool and Maul Handles.

panying illustration shows two hardwood blocks bolted to the end of a counter. They could as well be fastened on the side of a strong box, if more convenient. The blocks of hardwood are 3 in. thick, 10 in. long and about 5 in. wide, one end of each block being rounded to a half circle, which can be quickly done with a jig saw. The blocks are bolted as shown, one above and to the side of the other, the blocks being far enough apart so that a Sledge Handle can be inserted loosely between them. Mr. Forbes suggests that if a Handle is crooked $\frac{1}{4}$ in. one way it should be slipped to the point of the bend and the Handle pressed $\frac{3}{8}$ in. in the opposite direction. The amount of bending required to straighten Handles can be learned with a little experience. Our correspondent also says that a pair of blocks made heavier would straighten a buggy pole, but if painted the pole should be cloth wrapped to prevent marring the surface.

Requests for Catalogues, Etc.

The trade is given an opportunity in this column to request from manufacturers catalogues, price-lists, quotations, &c.

REQUESTS for catalogues, price-lists, quotations, &c., have been received from the following houses, with whom manufacturers may desire to communicate.

FROM C. A. KEEL, who has engaged in business in Hamlin, Kan., handling Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings, Window Glass, Paints, Oils and Queensware.

FROM SUTTON & CLARK, who have engaged in business in Bennington, Kan., handling Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings, Window Glass, Paints, Oils and Furniture. A tin shop is also carried on.

FROM CRANSTON BROS. HARDWARE COMPANY, which has put in a stock at Sandpoint, Idaho, consisting of Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings, Paints, Oils, Sporting Goods, Boats and Launches.

FROM WILLIAMS HARDWARE & STOVE COMPANY, INC., San Francisco, Cal., which has moved into its new store

at 974 Market street and increased its capital stock. The company handles Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings, Paints, Oils, Sporting Goods.

FROM HARNEY & Co., who have purchased the business of Christopher & Sons, Waverly, Ill. The firm carries Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings, Sporting Goods and Furniture.

FROM THE BESSETTE HARDWARE COMPANY, which has moved its stock from Saratoga Springs, N. Y., to Bennington, Vt., where the same lines will be handled, including Builders' and Heavy Hardware, Tin, Enameled and Wooden Ware, Brushes, Paint, Oils, Window Glass, Agricultural Implements and Cutlery.

Price-Lists, Circulars, Etc.

Manufacturers in Hardware and related lines are requested to send us copies of new catalogues, price-lists, &c., for our Catalogue Department and for notice in this column.

SAMUEL WINSLOW SKATE MFG. COMPANY, Worcester, Mass., New York office 84 Chambers street: Catalogue containing 36 pages, with cover in color design, illustrating 1909 line of Ice Skates. The kinds of Skates shown include Hockey, Rink, Wood Top, Lever Clamp, Speed, Sailing and Double Runner. In addition are Ankle Braces, Ice Skate Keys and Heel Button Plates.

EMPIRE PLOW COMPANY, Cleveland, Ohio: Catalogue devoted to Plows, Cultivators, Harrows, Garden Cultivators, Steel Single and Double Trees, Clevises, Plow Handles, &c.

OHIO CULTIVATOR COMPANY, Bellevue, Ohio: Catalogue No. 20, relating to Plows, Cultivators, Harrows, Field Rollers, Pulverizers, Corn and Cotton Planters, Shovel Plows, Power Presses, Wagons, Post Hold Diggers, &c.

EYELET TOOL COMPANY, 40 Lincoln street, Boston, Mass.: Illustrated booklet, 16 pages, of Eyelet Sets and Leather Punches, spring, bend and foot power, together with Belt Punches, Burr and Rivet Sets, Button Hole Cutters and Screw and Taper Tubes for machines.

GOULDS MFG. COMPANY, Seneca Falls, N. Y., and 16 Murray street, New York: Illustrated circular and July calendar of hand and power Rotary Force Pumps.

FREDERICK BRISTOW, East Orange, N. J.: Illustrated booklet of the Radial Distributor, having from 10 to 30 compartments for holding correspondence in small space on a desk, with bases from 13 x 9 $\frac{1}{2}$ x 4 $\frac{1}{2}$ to 13 x 12 $\frac{1}{2}$ x 6 $\frac{1}{2}$ in. in five models and seven styles.

NATIONAL CUTLERY COMPANY, Westmoreland and Boudinot streets, Philadelphia, Pa.: Illustrated descriptive catalogue, 76 pages, with discount sheet, of steel forged Scissors, Shears, Tinnerns' Snips, Safety Razors, Stropers, Letter Openers, Orange Clippers and Dental Shears and Snips.

AMONG THE HARDWARE TRADE.

The Ritter Hardware & Implement Company, Aspermont, Stonewall County, Texas, has been incorporated with a capital stock of \$10,000, the incorporators being M. V. Guest, W. P. Guest and J. Mayes.

W. O. Shideler has purchased the Hardware, Stove, Implement, Paint and Sporting Goods business of J. F. Hull, Neodesha, Kan., which will be run under the style of Shideler Supply Company.

The G. A. Supplee Company, which for a number of years has been engaged in the retail Hardware business at 1033 Market street, Philadelphia, Pa., has removed to new and larger quarters at 922 Chestnut street.

The Black-Walker Hardware Company, Breckenridge, Texas, has been incorporated with a capital stock of \$17,200 to conduct a retail Hardware business in Shelf and Heavy Hardware, Stoves, Tinware and House Fur-

nishings, Agricultural Implements, Sporting Goods, Furniture, Vehicles and Harness.

Shumaker & Shumaker, Centerville, Mich., have purchased the Hardware, Stove, Housefurnishing, Paint and Sporting Goods business of E. J. Barnabee, Menden, Mich.

The Columbia Hardware & Furnishing Company, Columbia, La., recently suffered the loss of its warehouse by fire.

G. C. Davis succeeds Davis & Merrit, Chanute, Kan., handling Shelf and Heavy Hardware, House Furnishings, Stoves, Tinware, Sporting Goods, Vehicles and Agricultural Implements.

C. C. Messinger has purchased the Hardware stock of Osborn Bros., Butternut, Mich., retailing Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Paints, Oils, &c.

The W. N. Harrison Company, Blockton, Iowa, has bought the business of Hickenlooper Bros., including Shelf and Heavy Hardware, Stoves, Tinware, House Furnishings and Agricultural Implements.

John Wilson's Butcher Knives.

Hermann Boker & Co., 101 Duane street, New York, have just received a large consignment of butcher knives from John Wilson, Sheffield, England, including two new styles of knives. One of these is an improvement on the standard John Wilson butcher knife, inasmuch as that a cocobolo handle is fastened to the knife by means of three large brass screws. This knife is made in 6, 7 and 8 in. sizes. The other knife is a boning knife made with an especially full and heavy rosewood handle.

The Badger Coaster Wagon.

The Garton Toy Company, Sheboygan, Wis., manufacturer of wagons, carts, juvenile automobiles, &c., make the Badger coaster with removable box. With the box in position, held by strap bolts, the device becomes a wagon, and when removed it can be used as a coaster. The body is constructed of well seasoned hardwood. The wheels are made of wood, with extra heavy shaved spokes, bent rock elm rims, tires of wrought steel shrunk on, strong malleable iron hub caps and bands. The gear is of selected stock securely braced to the body with round edge iron. The steering gear is made of extra heavy malleable iron and hardwood. The body and gear are varnished on the natural wood, decorated in red and black.

Universal Alcohol Stoves.

Landers, Frary & Clark, New Britain, Conn., and 302 Broadway, New York, have added to their line of alcohol utilities the Nos. 1 and 2 universal alcohol stoves for household purposes. Fig. 1 illustrates the No. 1 style, three pints capacity, with nickeled brass tank, japanned wrought iron frame, height 7 in. and diameter 8 in. Fig. 2 represents the No. 2 universal of double capacity, in reinforced wrought iron frame, japan finished, $21\frac{1}{2} \times 13\frac{3}{4} \times 6\frac{1}{4}$ in., supplying enough heat for a large standard size oven, such as are used in gasoline stoves. The fuel is denatured alcohol, clean and safe, which the burner itself generates into gas. The wind shield, Fig. 1, makes the stove especially effective in camps and other outdoor situations. Fig. 2 illustrates a stove of much greater capacity, suitable for bungalows, cottages, yachts, &c., where a clean and safe stove of adequate capacity is necessary. The burner is so constructed that the alcohol vapor and air is properly mixed, insuring perfect combustion and minimizing the consumption of alcohol, producing a sootless, smokeless and odorless flame. The corrugated upright tube of the burner contains the wick

thoroughly protected. When the fount is filled the wick is saturated. The tube being surrounded by flame, the alcohol in the wick is quickly converted into gas, which, coming through the small holes surrounding the burner, creates the blow-flame referred to. The burner is lighted by first turning down with the thumb screw the collar



Fig. 1.—No. 1 Universal Alcohol Stove.

surrounding the corrugated tube, when with two or three strokes of the miniature pump a small quantity of alcohol is raised, which, being lighted, soon gasifies the alcohol

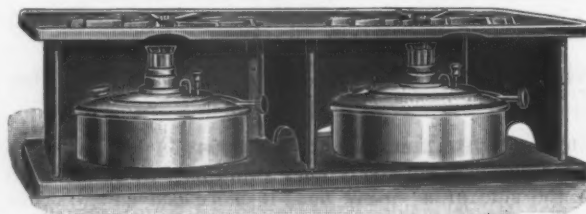


Fig. 2.—No. 2 Universal Alcohol Stove.

in the wick. The flame may be regulated by turning the thumb screw from a fierce blow-flame to a low, simmering one.

The A. A. Automatic Kitchen No. 2.

The A. A. Automatic Mfg. Company, 1945 Park avenue, New York, is making a line of automatic kitchens, one style of which is herewith shown. It consists of a metallic table, the top of which is white enameled, and upon it is mounted an electric motor and covered mechanism. A flexible shaft projects on either side, the outer end of which has a socket which fits over the axle of any of the utensils. The motor is operated from any electric lamp socket by the usual plug and wire connection. Either or both of the utensils are put in motion or stopped by turning small levers. To facilitate kitchen work the apparatus while beating eggs will at the same time do the dough mixing for making cake; or will chop meat and at the same time will peel the potatoes, &c. The illustration shows the butter churner and cake dough mixer in operation. Below the table are shown the potato peeler, egg beater, coffee grinder, meat and food chopper, fruit press and ice cream freezer, which operate interchangeably. The smaller articles are mounted on metallic boxes to bring the axles to the right height to make it convenient to slip on the flexible shaft. While in use the articles are held in position on the table by clamps. Style No. 1 machine has but one flexible shaft and runs but one utensil at once. Style No. 3 has the same mechanism as the one illustrated, but is mounted on a round table. The centre portion of the table, on which the motor and mechanism are mounted, is stationary, while the outer portion of the table may be revolved. The utensils are clamped to this outer position, which is revolved to bring any one or two utensils within reach of the flexible shafts. This arrangement eliminates the necessity of attaching and detaching the utensils from the table, except to clean them.

The tables with motor and mechanism are priced by themselves and such utensils as are required are purchased separately. The company also makes an auto-

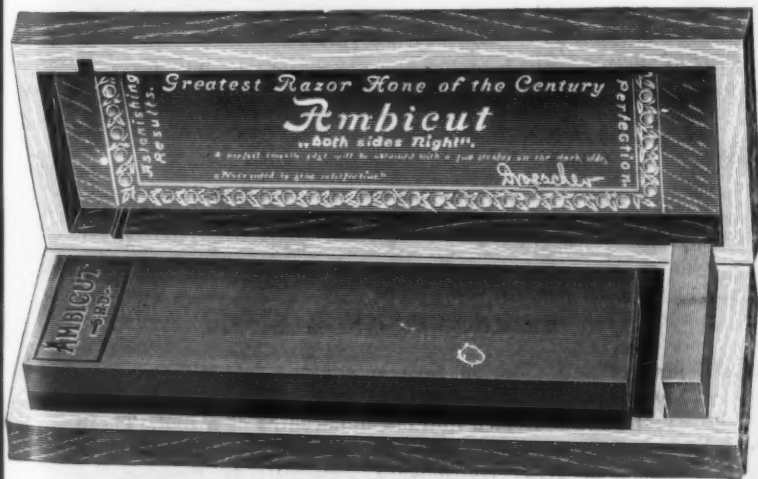


The A. A. Automatic Kitchen No. 2.—Any Two of the Kitchen Articles Shown Can Be Operated at the Same Time.

matic kitchen for use in hotels and restaurants, consisting of a shaft with as many flexible shaft connections as desired.

Ambicut Razor Hones.

S. R. Droescher, 79 Warren street, New York, has put on the market the Ambicut razor hone, which is two-sided, or two hones in one block, the coarser for sharpening and the reverse for finishing. This device is offered to overcome the difficulty of honing a razor satisfactorily with one grade of grit, the objection to which usually is that a single hone is either too fine or too coarse to begin and finish. This style of hone enables the individual to economize time by sharpening more rapidly on one side and yet by turning the hone over put on a delicate finishing edge without using two separate hones. The side stamped "Ambicut" is for the first operation. The hone proper is $5\frac{1}{4} \times 1\frac{1}{8} \times 9-16$ in., placed in a handsome mahogany hinged covered box, polished, with brass spring catch and hinges. At the right, as illustrated, is a compartment for a rubstone $1\frac{1}{8} \times \frac{3}{8} \times 9-16$ in., with which to dress the hone if there is any tendency to glaze on the



Ambicut Two in One Razor Hone

finish side. The stamped or coarser side may be used with water, soap or oil, but the finer side being a natural hone must be kept clean from grease, using water only for finishing. The outer dimensions of the box are $7\frac{1}{2} \times 2\frac{3}{4} \times 11-16$ in.

The Princess Automatic Washing and Wringing Machine.

The Princess Mfg. Company, 433 East Pearl street, Cincinnati, Ohio, has improved its washing machine, described in these columns March 5, 1908, by the addition of a wringer attachment, which is inclosed in the square covering shown on the lid of the machine. When the lid is down the machine washes the clothes by oscillating the dasher or rub board, which drives the water through the clothes. When the lid is raised the wringer attach-



The Princess Automatic Washing and Wringing Machine, Both Operations Being Performed by the Same Water Motor.

ment meshes into the cog wheel of the wringer shaft, the oscillating motion of the motor being thus automatically changed to a circular motion for wringing the clothes. When the lid is raised the dasher or rub board also automatically stops, and moves out of the way so as to give the operator plenty of room to feed clothes to the wringer. The machine is furnished with or without the wringer. The company explains that the efficiency of the wringer attachment is due to the powerful motor, which has no internal springs or floating valves and will not stop on dead center.

The 20th Century Mail Box, No. 4.

To the various styles of mail boxes made by the Wm. F. Heise Mfg. Company, 66 Union Park Court, Chicago,



The 20th Century Mail Box No. 4.

Ill., has been added the new one here illustrated. It is made of No. 24 gauge steel and is finished in japan and fast black. It is so constructed that the contents can-

not be removed without keys, two of which are supplied with the box. A spring is attached to the outside of the door for holding papers. The dimensions of the box are 10¼ in. in height, 5½ in. in width, with a depth of 2¾ in., and the shipping weight is 31 lb. per dozen. It is stated that the box has the approval of the postal authorities and is designed to be used for free delivery in cities only.

Richards Good Sense Grass Catcher.

The accompanying illustrations represent a grass catcher made of strong wire netting, ¾ in. mesh, reinforced at the bottom and top, which can be quickly



Fig. 1.—Richards Good Sense Grass Catcher Ready for Use.

applied to the handle of any lawn mower. The grass is dumped by raising the back end of catcher, with no danger, it is explained, of grass falling into the knives and gearing where dumped. It is pointed out that the grass does not work forward in the catcher and clog the knives while the mower is being operated. The hook in the

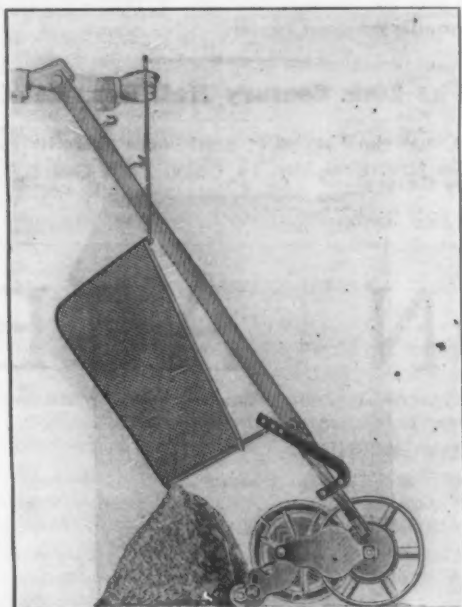
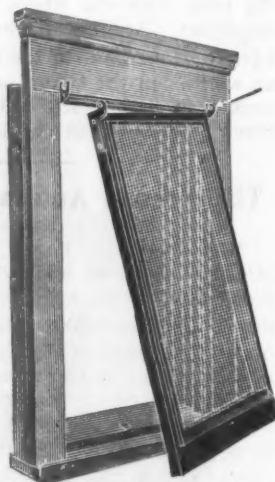


Fig. 2.—Richards Grass Catcher in Dumping Position.

handle of the mower, which holds back the supporting rod, may be located so that the handle will be in proper position for short or tall operators. The device is made in two sizes: for mowers 14 to 16 in. and for mowers 18 to 20 in. The weight per dozen is 60 lb. The catcher is put on the market by the Richards Mfg. Company, Aurora, Ill.

The E-Z-Way Hanger.

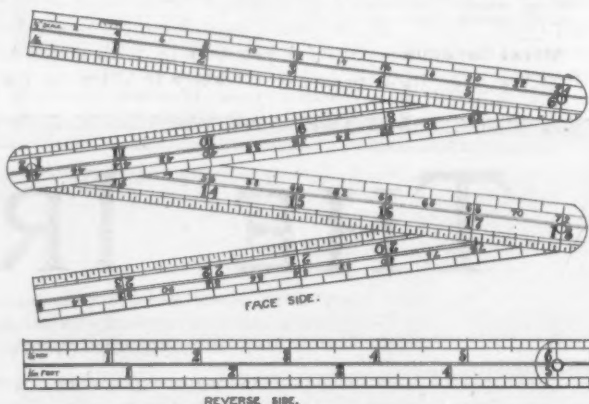
The window screen hanger manufactured by Peters & Grant, 2214 East Eighteenth street, Kansas City, Mo., and here illustrated, is designed to afford a simple, yet effective, means for holding window screens in place and at the same time allow them to be swung open from the bottom. The hanger consists of a male and female part, the former being nailed to the screen flush with the inside and top, while the latter is fastened against the window jam or strip, thus insuring a close fit when the screen is closed. It is claimed that screens will not bind or stick if properly hung on the hangers, and that because of their easy adjustment they can be hung by any one. They can also be conveniently removed for window cleaning, it being only necessary to lift the bearings out of their sockets. They can be used with equal facility for frame or brick houses, but the latter require a little larger hanger. The hangers are put up 12 sets in a box.



The E-Z-Way Window Screen Hanger.

Blix's Architects' and Engineers' Rule.

The 24-in. steel rule especially adapted to the use of architects, contractors and engineers, shown herewith, is offered by A. J. Blix, 720 Temple Court, Minneapolis, Minn. The upper edge of the face side carries a ¼ in. scale, with the number of feet carried through its full length, according to the scale, from 2 to 96 ft., which in measuring up plans, especially in estimating, insures rapidity, and it is claimed eliminates chances for errors in finding the number of feet to be measured. The lower edge of the face side is subdivided into 1-12 of inches for a distance of the first 12 inches, while the second 12 inches are subdivided into eighths and sixteenths of an inch. On the reverse side the upper edge is divided into



Blix's Architects' and Engineers' Rule.

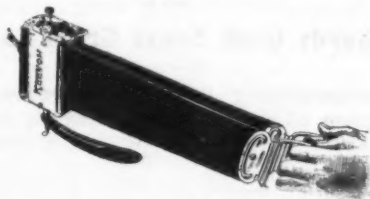
inches and these in turn subdivided into tenths. The lower edge of the same side is divided into tenths of a foot and subdivided into one-hundredths of a foot. These latter divisions, the manufacturer states, have been found to be of great convenience, especially in figuring the length of rafters, truss members, &c., where the figures develop some hundredths of a foot. By means of the rule the operator can find these hundredths on the rule which at the same time shows the exact number of inches and fractions thereof, thus saving the time and trouble of reducing the hundredths to inches and fractions by means of computation. In estimating a job considerable

time can be saved by the use of the rule, and accuracy can be insured in the matter of reading the number of feet to be found. The rule is also convenient for measuring long distances where the ordinary scale cannot be employed. Architects who supervise work will find it advantageous both in the matter of measuring the plans as well as in the convenience of carrying it in the vest pocket, as it measures only $\frac{1}{4} \times \frac{3}{4}$ in. and is 6 in. long when folded and placed in its leather case.

The Keenoh Automatic Razor Sharpener.

The Diamond Power Specialty Company, Detroit, Mich., has formed and solely controls the Keenoh Company, which will manufacture and market the Keenoh automatic razor sharpener shown herewith, which combines the principles of hollow ground, concave stroke and straight edge. An ordinary razor or safety blade is securely clamped in position in a nicked case, through which the strop runs on a simple arrangement of smoothly adjusted rollers. As the ends of the strop are alternately pulled, the razor blade is swung back and forth

into contact with the strop. The direction of the strop's stroke on the blade is parallel with the edge of the razor, producing in a few seconds, it is explained, a keen, true edge. When the regular or safety blade is clamped in, its edge is brought to the absolutely correct position, it is shown, whether the blades be broad or narrow, heavy or light, by a few turns of a thumb screw. For safety



The Keenoh Automatic Razor Sharpener for Ordinary and Safety Razors.

blades, an auxiliary holder is furnished, so that the blade is manipulated in the same manner as the ordinary razor. The sharpener is sold direct to the trade, packed one in a box, 12 in a case.

PAINTS, OILS AND COLORS

Animal, Fish and Vegetable Oils—

	per gal.
Linseed, Western, Raw.....	60 @ 61
State, Raw.....	60 @ 61
City, Raw.....	61 @ 62
Boiled, 1¢ per gal. advance on Raw.	
Raw, Calcutta, in bbls.....	75 @ 76
Lard, Prime Winter.....	88 @ 89
Extra No. 1.....	87 @ 88
No. 1.....	86 @ 87
Cotton-seed, Crude, L.O.B. mill, 1.67¢ 4.73	
Summer, Yellow, prime.....	5.60 @ 5.65
Summer, White.....	6.10 @ 6.20
Yellow, Winter.....	6.15 @ 6.20
Tallow, Acidless.....	56 @ 57
Menhaden, Brown, Strained.....	33 @ 34
Northern, Crude.....	23 @ 24
Southern.....	24 @ 25
Light Strained.....	33 @ 34
Bleached Winter.....	36 @ 37
Extra Bleached Winter.....	38 @ 39
Cocconut, Ceylon.....	74 @ 75
Cochin.....	74 @ 75
Cod, Domestic, Prime.....	40 @ 41
Newfoundland.....	40 @ 41
Red Elaine.....	43 @ 44
Saponified.....	5¢ 10 5¢ 6 1/2
Olive, Yellow.....	1.40 @ 1.50
Neatsfoot, Prime.....	55 @ 56
Palm, Lagos.....	5¢ 10 5¢ 5 1/2

Mineral Oils—

Black, 28 gravity, 25¢ 30 cold test.....	12 1/2 @ 13
28 gravity, 15 cold test.....	13 @ 13 1/2
Summer.....	12 @ 12 1/2
Cylinder, light filtered.....	20 @ 20 1/2
Dark, filtered.....	17 1/2 @ 18
Paraffine, 903-907 sp. gravity.....	14 @ 14 1/2
903 sp. gravity.....	13 @ 13 1/2
903 sp. gravity.....	10 1/2 @ 11
Red.....	13 @ 13 1/2

Miscellaneous—

Barites.....	per ton \$18.50 @ 20.50
White, Foreign.....	per ton 17.00 @ 18.00
Amer., floated.....	per ton 12.50 @ 15.00
Off color.....	per ton 3.00 @ 3.40
Chalk in bulk.....	per ton 3.00 @ 3.40

China Clay, Imported.....	per ton 11.50 @ 18.00
Cobalt, Oxide.....	per 100 lb 1.45 @ 2.00
Whiting, Commercial.....	per 100 lb 45¢ @ 50
Gilders.....	per 100 lb 52¢ @ 64
Ex. Gilders.....	per 100 lb 56¢ @ 68

Putty, Commercial—

In bladders.....	per 100 lb \$1.70 @ 2.00
In bbls. or tubs, 100 lb.....	1.20 @ 1.45
In 1 lb to 5 lb tins.....	2.65 @ 3.25
In 12 1/2 to 50 lb tins.....	1.50 @ 1.90

Spirits Turpentine—

In Oil bbls.....	46 1/2 @ 47
In Machine bbls.....	47 @ 47 1/2

Glue—

Cabinet.....	per 100 lb 12 @ 15
Common Bone.....	7 1/2 @ 9
Extra White.....	18 @ 24
Fish, liquid, 50 gal. bbls., per gal.....	60 @ 62
Foot Stock, White.....	12 @ 14
Foot Stock, Brown.....	9 @ 11
German Common Hide.....	10 @ 12
German Hide.....	12 @ 18
French.....	10 @ 10
Irish.....	13 @ 16
Low Grade.....	10 @ 12
Medium White.....	14 @ 19

Gum Shellac—

Bleached, Commercial.....	per 100 lb 16 @ 16 1/2
Bone Dry.....	20 @ 21
Button.....	20 @ 30
Diamond I.....	26 @ 27
Fine Orange.....	20 @ 21
A. C. Garnet.....	15 1/2 @ 16
Light Orange.....	17 @ 19
Kala Button.....	19 @ 21
D. C.....	26 @ 27
Cetagon B.....	22 @ 23
T. N.....	11 @ 15
V. S. O.....	24 @ 25

Colors in Oil—

Black, Lampblack.....	per 100 lb 12 @ 14
Blue, Chinese.....	36 @ 46
Blue, Prussian.....	32 @ 36

Blue, Ultramarine.....	per 100 lb 13 @ 16
Brown, Vandyke.....	11 @ 14
Green, Chrome.....	12 @ 16
Green, Paris.....	24 @ 24
Sienna, Raw.....	12 @ 15
Sienna, Burnt.....	12 @ 15
Umber, Raw.....	11 @ 14
Umber, Burnt.....	11 @ 14

White and Red, Lead &c.—

Lead, English white, in Oil.....	10¢ @ 10 1/2
Lead, American White:	
Dry and in Oil, 100, 250 and 500 lb kegs.....	6%
Dry and in Oil, 25 and 50 lb kegs.....	7
Dry and in Oil, 12 1/2 lb kegs.....	7 1/2
In Oil, 25 lb tin pails.....	7 1/2
In Oil, 12 1/2 lb tin pails.....	7 1/2
In Oil, 1, 2, 3 and 5 lb tin cans, as't.....	8%
Red Lead and Litharge:	
In 100 lb kegs.....	7
In 25 and 50 lb kegs.....	7 1/2
In 12 1/2 lb kegs.....	7 1/2
In lots of less than 500 lbs, 1/2¢ per lb advance over above prices of White and Red Lead and Litharge	
Lead, American, Terms: On lots of 500 lbs and over, 60 days, or 2% for cash if paid in 15 days from date of invoice.	

Zinc, Dry—

American, dry.....	5 1/4 @ 5 1/2
Red Seal (French process).....	6 1/2 @ 7
Green Seal.....	7 1/4 @ 7 1/2
German Red Seal (French process).....	7 1/4 @ 7 1/2
White Seal.....	7 1/2 @ 8
French, Red Seal.....	8 1/2 @ 9
Green Seal.....	10 1/2 @ 10 1/2

Dry Colors—

Black, Carbon.....	per 100 lb 7 @ 10
Black Drop, American.....	3 1/2 @ 8

Black Drop, English.....	per 100 lb 5 @ 15
Black, Ivory.....	16 @ 20
Lamp, commercial.....	3 @ 5
Blue, Celestial.....	4 @ 6
Blue, Chinese.....	30 @ 31
Blue, Prussian, Domestic.....	28 @ 30
Blue, Ultramarine.....	5 @ 15
Brown, Spanish.....	1 1/2 @ 1
Carmine, No. 40.....	\$2.75 @ \$2.85
Green, Chrome, ordinary.....	3 1/2 @ 5
Green, Chrome, pure.....	17 @ 25
Metallic Paint, per ton:	
Brown.....	\$16.50 @ \$22.00
Red.....	per ton \$14.00 @ \$18.00
Ocher, American.....	per ton \$12.00 @ \$15.00
American Golden.....	4 @ 5
French.....	14 @ 2
Foreign Golden.....	3 @ 4
Orange Mineral, English.....	10 @ 12
French.....	12 1/2 @ 13
German.....	12 @ 13
American.....	8 1/2 @ 10
Red, Indian, English.....	5 @ 7
American.....	3 @ 3 1/2
Red, Turkey, English.....	4 @ 10
Red, Tuscan, English.....	7 @ 10
Red, Venetian, Amer.....	per 100 lb \$0.75 @ 1.50
English.....	per 100 lb \$1.15 @ 1.90
Sienna, Italian, Burnt and Powdered.....	3 @ 9
Italian, Raw, Powdered.....	3 @ 7
American, Raw.....	2 1/2 @ 3
American Burnt and Pow'd.....	2 1/2 @ 3
Talc, French.....	per ton \$18.00 @ 25.00
American.....	per ton 15.00 @ 25.00
Terra Alba, French.....	per 100 lb .80 @ 1.00
English.....	per 100 lb .90 @ 1.00
American.....	per 100 lb, No. 1, .75 @ .80
American.....	per 100 lb, No. 2, .60 @ .65
Umber, Thick, Bnt. & Pow'd.....	2 1/2 @ 3
Turkey, Raw and Powdered.....	2 1/2 @ 3
Burnt, American.....	2 @ 2 1/2
Raw, American.....	2 @ 2 1/2
Yellow Chrome, Pure.....	12 1/2 @ 13
Oxide Red, American.....	2 @ 7 1/2
Vermilion, English, Imported.....	@ 70
Chinese.....	\$0.90 @ 1.00

THE IRON AGE

The oldest paper in the world devoted to the interests of the Hardware, Iron, Machinery and Metal Trades, and a standard authority on all matters relating to those branches of industry.

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General Goods.—Goods which are made by more than one manufacturer are printed in *Italics*. The prices named represent those obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are usually given to larger buyers.

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Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33% @ 33% & 10% signifies that the price of the goods in question ranges from 33% per cent. discount to 33% and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued annually, a book of 376 pages, which is sent free of charge to every subscriber to *The Iron Age*. It gives a classified list of the products of our advertisers and thus serves as an up-to-date DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—"The Iron Age Standard Hardware Lists," 218 pages, price \$2, prepaid, contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Adjusters, Blind—

Columbian and Domestic.....33%
North's.....10%
Upson's Patent, 3/4 gro., \$29.90.....10%
Zimmerman's—See Fasteners, Blind.

Window Stop—

Ives' Patent.....10%
Ives' Stop Bead Screws and Washers.....10%
Taplin's Perfection.....10%

Ammunition—See Caps, Cartridges, Shells, &c.

Anti-Rattlers—

Fernald Mfg. Co. Burton Anti-Rattlers, 3/4 doz. pairs, Nos. 1, \$0.75; 2, \$0.60; 4, \$1.00; 5, \$0.50.
Fernald Quick Shifter, 3/4 doz. pairs.....\$2.00@3.00

Anvils—American—

Eagle Anvils.....\$1.00 @ \$2.00
Hay-Budden, Wrought.....\$0.90 @ \$1.00
Trenton.....\$0.90 @ \$1.00

Imported—

Swedish Solid Steel Paragon, 3/4 lb.....10@10%
Swedish Solid Steel Sisco, Superior, 3/4 lb.....10@10%
Ives' Wright & Sons, 3/4 lb. \$1 to \$1.50; 350 to 600 lb., \$1.50 @ \$2.00

Anvil, Vice and Drill—

Millers Falls Co., \$18.00.....15@10%
Apple Parers—See Parers, Apple, &c.

Aprons, Blacksmiths'—

Livingston Nail Co.....10%

Augers and Bits—

Com. Double Spur.....30%
Jennings' Patn., Bright.....65@10%
Black Lip or Blued.....65@10%
Boring Mach. Augers.....70%
Car Bits, 12-in. twist.....40@10%
Ford's Auger and Car Bits.....40@10%
Ft. Washington Auger Co., Concord's.....35%
Forster Pat. Auger Bits.....25%
C. E. Jennings & Co.:
No. 19 ext. lip, R. Jennings' list, 25@7%
No. 30, R. Jennings' list.....50%
Russell Jennings.....25@13@2%
L'Hommedieu Car Bits.....15%
Mayhew's Countersink Bits.....45%
Pugh's Black.....25%
Pugh's Jennings' Pattern.....35%
Snell's Auger Bits.....60%
Snell's Bell Hangers' Bits.....60%
Snell's Car Bits, 12-in. twist.....60%
Snell's King Auger Bits.....50%
Snell's Star Auger Bits.....50@10%
Swan's.....65@10%
Swan's.....65@10%
Wright's Jennings' Bits.....50%

Bit Stock Drills—

See Drills, Twist.
Expansive Bits—
Clark's Pattern, No. 1, 3/4 doz., \$28;
No. 2, \$18.....60@10%
Ford's, Clark's Pattern.....60@10%
C. E. Jennings & Co., Steer's Pat.....25%
Lavigne Pat., small size, \$3.00; large size, \$5.00.....60%
Swan's.....60%

Gimlet Bits—

Common Dbl. Cut.....\$3.00@3.25
German Pattern, Nos. 1 to 10, \$1.75; 11 to 13, \$3.75

Hollow Augers—

Bonney Pat., per doz.....\$5.00@6.00
Ames.....20@10%
Universal.....20%
Ship Augers and Bits—
Ship Augers.....40@10%
Ford's.....33%
C. E. Jennings & Co.:
L'Hommedieu's.....67%
Watrous'.....33%
Snell's.....18%

Awl Hafts—See Handles, Mechanics' Tool.

Awls—

Brad Awls:
Handled.....gro. \$2.75@3.00
Unhanded, Shilded.....gro. \$3.00@3.25
Unhanded, Patent.....gro. \$3.00@3.25
Peg Awls:
Unhanded, Patent.....gro. \$1.00@1.25
Unhanded, Shilded.....gro. \$1.00@1.25
Scratch Awls:
Handled, Com.....gro. \$3.50@4.00
Handled, Rocket.....gro. \$11.50@12.00
Elmore Tool Mfg. Co.:
Timers and Brad Awls.....55@7%
Scratch Awls.....60%

Awl and Tool Sets—See Sets, Awl and Tool.

Axes—

Single Bit, base weights: Per doz.
First Quality.....\$4.75@5.00
Second Quality.....\$4.25@4.50
Double Bit, base weights:
First Quality.....\$7.00@7.50
Second Quality.....\$6.50@6.75

Axle Grease—

See Grease, Axle.

Axles—

Concord, Loose Collar.....4/4@4 1/2
Concord, Solid Collar.....4/4@5
No. 1 Common, Loose.....3/4@4
No. 1 1/2 Com., New Style.....4/4@4 1/2
No. 2 Solid Collar.....4/4@4 1/2
Half Patent:
Nos. 7, 8, 11 and 12.....70%
Nos. 13 to 14.....70%
Nos. 15 to 18.....70@10@70@10@65%
Nos. 19 to 22.....70@10@70@10@65%

Boxes, Axes—

Common and Concord, not turned.....lb., 50@60
Common and Concord, turned.....lb., 60@70
Half Patent.....lb., 9@10

Bait—

Hendryx:
A Bait.....20%
B Bait.....25%
Competitor Bait.....20@25%

Balances—

Caldwell new list.....50@10%
Pulman.....50@10%

Spring—

Light Spring Balances.....60@60@5%
Chatillon's:
Light Spg. Balances.....50@50@10%
Straight Balances.....40@40@10%
Circular Balances.....50@10%
Large Dial.....30%

Barb Wire—See Wire, Barb.

Bars—

Steel Crowbars, 10 to 40 lb. per lb., 2 1/4 @ 2 1/2

Towel—

No. 10 Ideal, Nickel Plate, 3/4 gro. \$3.50

Beam, Scale—

Scale Beams.....40%
Chatillon's No. 1.....30%
Chatillon's No. 2.....40%

Beaters, Carpet—

Holt-Lyon Co.:
No. 12 Wire Coppered 3/4 doz. \$0.80;
Tinned.....\$0.85
No. 11 Wire Coppered 3/4 doz. \$1.15;
Tinned.....\$1.20
No. 10 Wire Tinned.....3/4 doz. \$1.50

Beaters Egg—

Dover Stamping & Mfg. Co.:
Genuine Dover, per gro. No. 1, Tumbler Size, \$7.50; No. 2, Family Size, \$7.50; No. 3, Extra Family Size, \$24.00; No. 4, Hotel Size, \$30.00.

Holt-Lyon Co.:
Holt, per doz., No. 5, Jap'd. \$0.80;
No. A, Jap'd. \$1.15; No. B, Jap'd. \$1.85; No. 6, Jap'd. \$1.65.
Lyon, Jap'd, per doz., No. 2, \$1.35.

Taplin Mfg. Co.: Improved Dover, per gro. No. 60, \$5.00; No. 75, \$6.50; No. 100, \$7.00; No. 102, Tin'd. \$8.50; No. 150, Hotel, \$15.00; No. 152, Hotel Tin'd. \$17.00; No. 200, Tumbler, \$28.50; No. 202, Tumbler Tin'd. \$30.50; No. 300, Mammoth, per doz., \$25.00.

Bellows—

Blacksmith, Standard List:
Split Leather.....60@10@65%
Grain Leather.....50@60@10%
Hand—
Inch.....6 7 8 9 10
Doz. \$3.00 3.50 6.00 6.50 7.50

Molders—

Inch.....10 12 15 18
Doz. \$7.50 9.00 12.00 15.00

Bells—

Wrought Cow Bells.....75%
Jersey.....75@10%
Texas Star.....50%

Door—

Home, R. & E. Mfg. Co.'s.....55@10%

Hand—

Polished, Brass.....60@60@10%
White Metal.....60@60@10%
Nickel Plated.....50@10%
Sticks.....50@10%
Cone's Globe Hand Bells.....33@35%

Miscellaneous—

Farm Bells.....lb., 2 1/4 @ 2 1/2
Church and School.....60@60@10%

Belting—

First Quality, Ex. Hy., Strictly Short Lap.....60@10%
Standard.....70@10@70@10@65%
Light Double.....75@10%
Cut Leather Lacing.....45@50%
Leather Lacing Sides, per sq. ft. 25¢

Rubber—

Competition (Low Grade).....70@10@75%
Standard.....60@10@70%
Best Grades.....40@50%

Bench Stops—

See Stops, Bench

Benders and Upsetters, Tire—

Green River Tire Benders and Upsetters.....20%

Bicycle Goods—

John S. Leng's Son & Co.'s 1908 list:
Chain, Parts, Spokes.....50%
Tubes.....60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See Augers and Bits.

Blocks—

Common Wooden.....75@75@10%
B. & L. B. Co.:
Boston Wood Snatch, 50%; Eclipse Steel, 75%; Hollow Steel, 50@10%
Star Wire Rope, 50%; Tarbox Metal Snatch, 50%; Tarbox New Style Steel, 50@10%; Wire Rope Snatch, 50%.

Lane's Patent Automatic Lock and Junior.....30%
See also Machines, Hoisting.

Boards, Stove—

Paper and Wood Lined.....55%
Embossed.....55%

Boards, Wash—

See Washboards.

Bobs, Plumb—

Kenell & Esser Co.....33%@10%

Belts

Carriage, Machine, &c.—Common Carriage (cut thread): 3/4 & 6 and smaller.....75@10%
Larger and longer.....70@10%
Common Carriage (rolled thread): 3/4 & 6, smaller and shorter, 75@10@5%
Phila. Eagle, \$3.00 list.....80@—
Bolt Ends, with C. & T. Nuts, 70@10%

Machine (Cut Thread): 3/4 & 4 and smaller.....75@10@5%
Larger and longer.....70@10@5%

Door and Shutter—

Cast Iron Barrel, Japanned, Round Brass Knobs:
Inch.....3 4 5 6 8
Per doz. \$0.30 .35 .45 .60 .80

Cast Iron Spring Foot, Jap'd, Inch.....6 8 10
Per doz.....\$1.20 1.50 2.25

Cast Iron Chain, Flat, Japanned, Inch.....6 8 10
Per doz.....\$1.00 1.40 1.65

Cast Iron Flat Shutter, Jap'd, Brass Knobs:
Inch.....6 8 10
Per doz.....\$0.75 .95 1.25

Wrought Barrel Japanned, 80@10@80@10@65%

Barrel Bronzed.....60@10%
Spring.....70@10@70@10@10%
Shutter.....50@5@50@10@65%
Square Neck.....75@75@10%
Square.....70@10@10@80%
Ives' Mortise.....10%
Ives' Wrought Metal.....10%

Expansion—

F. H. Evans' Crescent.....60@60%
Richards Mfg. Co.....35@10%
Star Expansion Bolt Co.:
Star, Lag Screw Type.....60@10@5@24%
Star, Wood Screw Type.....60%
Star, Machine, Single Wedge.....60@10%

Star, Machine, Double Wedge.....60@10%
Steward & Romain Mfg. Co.:
Style No. 13, Double.....60@10%
Style No. 1, Single.....60@10%
Style No. 100, Dbl. Jaw, Single.....55%
Lag Screw.....60%

Plow and Stove—

Plow.....65@65@70%
Stove.....85@85@5%

Tire—

Common Iron.....80%
Norway Iron.....80%
American Screw Co.:
Norway Phila., list Oct. 16, '94.....80%
Eagle Phila., list Oct. 16, '94.....82%
Bay State, list Dec. 28, '94.....80%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '94.....80%
Eagle Phila., list Oct. 16, '94.....82%
Eclipse, list Dec. 28, '94.....80%
Russell, Burdall & Ward Bolt & Nut Co.:
Empire, list Dec. 28, '94.....80%
Norway Phila., list Oct. 16, '94.....82%
Shelton Co.:
Tiger Brand, list Dec. 28, '94.....80%
Phila., Eagle, list Oct. 16, 1881.....82%
Upson Nut Co.:
Tire Bolts.....72@4%

Borers, Bung—

Borers Bung, Ring, with Handle:
Inch.....1 1/4 1 1/2 1 3/4 2
Per doz.....\$1.80 5.60 6.40 8.00
Inch.....2 1/4 2 1/2 2 3/4 3
Per doz.....\$3.65 11.50
Enterprise Mfg. Co., No. 1, \$1.25; No. 2, \$1.75; No. 3, \$2.50 each.....25%

Boxes, Mitre—

C. E. Jennings & Co.....25%
Langdon, New Langdon and Langdon Improved, 20@10%; Langdon Acme.....15@10%
Perfection.....40%
Seavey.....45%

Braces—

Common Ball.....\$1.50 @ \$1.75
Barber's.....50@10@10@10%
Fray's Genuine Spofford's.....60%
Fray's No. 61, 106, 206, 614.....50%
C. E. Jennings & Co.....50@5%
Mayhew's Ratchet.....60%
Mayhew's Quick Action Hay Pat.....50%
Millers Falls Drill Braces.....25@10%
P. S. & W. Co., Peck's Pat.....60@10%

Brackets—

Wrought Steel.....80@80@5%
Bradley Metal Clasp.....50@10@10@5%
Griffin's Pressed Steel.....75@75@10%
Griffin's Folding Brackets.....70@10%
Stanley's Pressed Steel.....50%
Stanley's Folding Brackets.....70@10@5%
Taplin Victor Handy Egg Beater Bracket.....3/4 doz. \$1.50

Bright Wire Goods—

See Wire and Wire Goods.

Broilers—

Kilbourne Mfg. Co.....75@20%
Wire Goods Co.....75%

Buckets, Galvanized—

Mfr's list, price per gross:
Quart.....10 12 14
Water, Light.....\$28.35 30.75 31.75
Water, Ex. Heavy.....46.85 49.35 53.25
Ft. Rd. Btm.....33.50 35.00 39.90
Well.....37.35 41.35 45.35
10474655% @—
Prices low and irregular.

Bull Rings—See Rings, Bull.

Butts—

Wrought.....65%
Cast Brass, Tiebout's.....40@10%

Cast Iron—

Fast Joint, Broad.....40@10@50%
Fast Joint, Narrow.....40@10@50%
Loose Joint.....70@10@75%
Loose Pin.....70@10@75%
Mayer's Hinges.....70@70@5%
Parliament Butts.....70@70@5%

Wrought Steel—

BRIGHT.

Light Narrow, Light Reversible.....75@5%
Reversible and Broad.....75@10%
Loose Joint, Narrow, Light Inside Blind, &c.....75%
Back Flaps, Table Chest.....70%

Bronzed—

Light Narrow, Loose Pin.....55%
Light, Loose Pin, Ball Tip.....65%
Broad.....55%

Extra, 5 @

Cages, Bird—

Hendryx Brass: Series 3000, 5000, 1100, net list; 1200, 15%; 200, 300, 900, 30%
Hendryx Bronze: Series 700, 800, 30%
Hendryx Enamelled.....35%

Calipers—See Compasses.**Calks, Toe and Heel—**

Blunt, 1 prong, per 100 lb., \$3.50 @ \$3.85
Sharp, 1 prong, per 100 lb., \$4.00 @ \$4.35

Burke's, 1 pg. Blunt Toe, 3/4"; 2 pg. Blunt Toe, 4/4"; 1 pg. Sharp Toe, 4/4"; 2 pg. Sharp, 4/4"; Blunt Heel, 4/4"; Sharp Heel, 4/4"
Lautier, Blunt, 4/4"; Sharp, 4/4"
Perkins', Blunt, 1 lb, 3.65¢; Sharp, 4.15¢

Can Openers—

See Openers, Can.

Caps, Percussion—

Eley's E. B.52 @ 55¢
G. D.per M. 34 @ 35¢
F. L.per M. 40 @ 42¢
G. E.per M. 48 @ 50¢
Musketper M. 62 @ 65¢

Primers—

Berdan Primers, \$2 per M. 20¢
Primer Shells and Bullets, 15¢
All other primers per M. \$1.52 @ \$1.60

Carpet Stretchers—

See Stretchers, Carpet.

Cartridges—

Blank Cartridges:
32 C. F., \$5.5010¢
38 C. F., \$7.0010¢
22 cal. Rim, \$1.5010¢
32 cal. Rim, \$2.7510¢
B. B. Caps, Con. Ball, Sued. \$1.90
B. B. Caps, Round Ball, \$1.10
Central Fire25¢
Target and Sporting Rifle, 15¢
Printed Shells and Bullets, 15¢
Rim Fire, Sporting50¢
Rim Fire, Military15¢

Castors—

Bed65 @ 70¢
Plate60 @ 65¢
Philadelphia70 @ 75¢
Acme, Ball Bearing35¢
Gem (Roller Bearing)70 @ 10¢
Steel Gem (Roller Bearing)70¢
Standard Ball Bearing45¢
Yale (Double Wheel) low list, 40¢
Cattle Leaders—
See Leaders, Cattle.

Chain, Proof Coil—

American Coil, Straight Link:
3-16 1/4 5-16 3/4 1/2 3/4
7-16 4-8 3-8 3-8 3-10 3-10
3-16 1 1/2 to 1 1/4 inch,
\$2.90 3.00
German Coil70¢
German Pattern Coil:
6-0 to 170 @ 10¢
2 and 360 @ 10¢
4, 5 and 650 @ 10¢

Halter—

Halter Chains60¢ @ 60¢
German Pattern Halter Chains,
list July 2, '9770¢
Covert Mfg. Co.35¢

Cow Ties—

See Halters and Ties.

Trace, Wagon, &c.—

Traces, Western Standard: 100 pr.
6-6-3, Straight, with ring, \$26.00
6-6-2, Straight, with ring, \$27.00
6-8-2, Straight, with ring, \$30.00
6-10-2, Straight, with ring, \$35.00
NOTE—Add 2¢ per pair for Hooks
Twist Traces: add per pair for Nos. 2
and 3, 2¢; No. 1, 3¢; No. 9, 4¢ to price of
Straight Link.
Eastern Standard Traces, Wag-
on Chain, etc.70¢ @ 10¢

Miscellaneous—

Jack Chain:
Iron60 @ 10¢ @ 60¢ @ 10¢
Brass65¢
Safety and Plumbers' Chain, 75¢
Gal. Pump Chain, 1 lb., 4/4¢
Bridgeport Chain Co.:
Triumph Halter and Collar, 35¢ @ 40¢
Triumph Dog40¢ @ 60¢
Brown Halter and Collar, 30¢ @ 40¢
Covert Mfg. Co.:
Breast, Halter, Heel, Rein, Sta-
tion40¢
Oneida Community:
American Halter, Dog and Kennel
Chain35¢ @ 40¢
Niagara Dog Leads and Kennel
Chain45¢ @ 50¢
Wire Goods Co.:
Dog Chain70¢
Universal Dbl. Jointed Chain, 70¢

Chain and Ribbon, Sash—

Oneida Community:
Steel Chain60¢
Pullman:
Bronze Chain, 60%; Steel Chain,
Coppered60¢ @ 10¢
Sash Chain Attachments, per set, 3¢
Alumino Sash Ribbon, per 100
ft.\$2.00 @ \$3.00
Sash Ribbon Attachments, per set, 3¢

Chalk—

Carpenters' Bluegro., 50¢ @ 55¢
Carpenters' Redgro., 50¢ @ 55¢
Carpenters' Whitegro., 40¢ @ 45¢

Checks, Door—

Bardsley's45¢
Pullman, per gro.\$4.00
Russwin35¢

Chests, Tool—

American Tool Chest Co.:
Boys' Chests, with Tools55¢
Youths' Chests, with Tools40¢
Gentlemen's Chests, with Tools30¢
Farmers', Carpenters, etc., Chests,
with Tools20¢
Machinists' and Pipe Fitters'
Chests, Empty45¢
Tool Cabinets45¢
C. E. Jennings & Co.'s Machinists'
Tool Chests72¢

Chisels—

Socket Framing and Firmer
Standard List80¢ @ 10¢ @ 80¢ @ 10¢
Buck Bros.30¢
C. E. Jennings & Co.:
Socket Firmer No. 1025¢ @ 7 1/2¢
Socket Framing No. 1525¢ @ 7 1/2¢
Swan's66¢ @ 70¢
L. & I. J. White & Co.30¢ @ 35¢

Tanged—

Buck Bros.30¢
C. E. Jennings & Co. Nos. 191, 18125¢
L. & I. J. White & Co.25¢ @ 35¢

Cold—

Cold Chisels, good quality, 13¢ @ 15¢
Cold Chisels, fair quality, 11¢ @ 12¢
Cold Chisels, ordinary, 9¢ @ 10¢
Elmore Tool Mfg. Co.:
Cold Chisels50¢ @ 55¢

Chucks—

Almond Drill Chucks35¢
Almond Turret Six-Tool Chuck40¢
Beach Pat. each \$8.0035¢ @ 5¢
Blacksmith's25¢
Cincinnati Chuck Co.:
Independent 4-jaw Reversible35¢
Empire25¢
Jacobs' Drill Chucks35¢
Morrow Ball Bearing Drill Chucks35¢
Pratt's Positive Drive25¢
Skinner Lathe Chucks:

Independent35¢
New Model, 25%; Geared Pat-
tern, 25%; Skinner Patent, 25%
Positive Drive40¢
Planer Chucks20¢
Standard45¢
Drill Press Vises30¢
Face Plate Vises35¢
Standard Tool Co.:
Improved Drill Chuck45¢
Union Mfg. Co.:
Combination, Nos. 1, 2, 3, 4, 5, 6,
7, 8 and 17, 40%; No. 2135¢
Scroll Combinations, Nos. 83 and
8430¢
Geared Scroll, Nos. 33, 34 and 3525¢
Independent Iron, Nos. 18 and 31835¢
Independent Steel, No. 6435¢
Union Drill, Nos. 000, 00, 100, 101,
102, 103, 10435¢
Union Car Drill25¢
Universal, 11, 12, 16, 17, 13, 14, 15, 40%
Universal No. 4235¢
Iron Face Plate Vises, Nos. 28, 30,
40 and 5035¢
Steel Face Plate Vises, Nos. 79 and
7230¢

Westcott Patent Chucks:
Lathe Chucks50¢
Little Giant Auxiliary Drill50¢
Little Giant Double Grip Drill50¢
Little Giant Drill, Improved50¢
Onida Drill50¢
Scroll Combination Lathe50¢
Whitaker Mfg. Co.:
National Drill25¢

Clamps—

Carriage Makers', Star, P., S. & W.
Co.50¢
Resly, Parallel30¢ @ 10¢
Hammer & Co.:
Adjustable20¢ @ 5¢
Carriage Makers' H. P. Screw40¢ @ 5¢
Myers' Hay Rack50¢
Lineman's Swedish Neverturn65¢
Saw Clamps, see Vises, Saw Files.

Cleaners, Drain,

Iwan's Champion, Adjustable50¢
Iwan's Champion, Stationary40¢

Sidewalk—

American Fork & Hoe Co.:
Star, 1/2 doz., Socket, \$4.00;
Shank, 1/2 doz., X 7/8, \$3.50; Shank,
X 1\$3.75

Cleavers, Butchers—

Foster Bros.30¢
Fayette R. Plumb30¢
L. & I. J. White Co.30¢

Clippers, Horse and

Chicago Flexible Shaft Co.:
1902 Chicago Horse, each, \$10.75
20th Century Horse, each, \$5.00
Lightning Belt Horse, each, \$15.00
Chicago Belt Horse, each, \$20.00
Stewart's Enclosed Gear Ball
Bearing Horse, each, \$7.50
Stewart's New Model Sheep
Shearing Machine, each, \$12.75
Stewart Enclosed Gear Shear-
ing Machine, No. 8, each, \$9.75

Clips, Axle—

Regular Styles80¢ @ 10¢

Cloth and Netting, wire

—See Wire, &c.

Cocks, Brass—

Hardware List:

Plain Bibbs, Globe, Kerosene,
Racking, Liquor, Bottling,
&c75¢
Compression Bibbs70¢

Coffee Mills—

See Mills, Coffee.

Collars, Dog—

Nickel Chain, Walter B. Stevens &
Son's list40¢
Leather, Walter B. Stevens & Son's
list60¢

Compasses, Dividers, &c.

Ordinary Goods75¢ @ 75¢ @ 5%

Conductor Pipe,—

L. C. L. to Dealers:
Gal. Steel. Charcoal. Copper.

Northeastern:
70¢ @ 10¢— 50¢ @ 10¢ 7 1/2¢ 50¢ @ 10¢

Eastern:
75¢ @— 50¢ @ 10¢ 7 1/2¢ 50¢ @ 10¢

Central:
75¢ @— 60% 50¢ @ 10%

Northwestern:
75¢ @— 60% 50¢ @ 10%

Western:
70¢ @ 10¢— 50¢ @ 12 1/2¢ 50¢ @ 15%

Tennessee:
70¢ @ 10¢— 50¢ @ 12 1/2¢ 50¢ @ 15%

Southern:
70¢ @ 10¢— 50¢ @ 12 1/2¢ 50¢ @ 15%

Southwestern:
70¢ @— 50¢ @ 15% 50¢ @ 15%

Terms, 60 days: 2% cash 10 days. Fac-
tory shipments generally delivered.

See also Eave Troughs.

Coolers, Water—

L. & G. Mfg. Co.:
Galvanized, 2 3 4 6 8
Galvanized, ea. \$1.85 \$2.00 \$2.25 \$2.50 \$3.00
Galvanized, Lined, side handles,
Gal.2 3 4 6 8
Each\$1.95 \$2.15 \$2.40 \$3.30 \$4.15
White Enamelled10%
Agate Lined10%

Coppers, Tools—

See Tools, Coopers.

Coppers, Soldering—

Soldering Coppers, 3 lb. to pair
and heavier, 21¢; lighter
than 3 lb. to pair23¢ @ 5¢

Cord—Sash—

Braided, Drab1b. 35¢
Braided, White, Com. Nos. 8
to 12, 22¢; No. 7, 23¢; No.
6, 24¢. In lots of 12 doz. or
over, 1 cent less per pound.

Cable Laid Italian, lb., No. 18, 37¢
Italian, lb., A, No. 18, 25¢; B, 22¢
Common Indialb. 11¢ @ 11 1/2¢

Cotton Sash Cord, Twisted, 18¢ @ 20¢
Patent Russianlb. 20¢

Cable Laid Russialb. 21¢
India Hemp, Br'd'd.lb. 21¢
India Hemp, Twisted, lb. 13¢ @ 14¢

Patent India, Twisted, lb. 17¢
Pearl Braided, cotton, No. 6, 10 lb.,
20¢; No. 7, 19¢; Nos. 8 to 12,
19¢; in 12 doz. to 100 doz. lots,
Edgelyne, Braided, Nos. 8 to 12,
20¢; 1, 20¢; 6, 27¢.

Harmony Cable Laid Italian, Nos. 7
to 10lb. 23¢

Pullman:
Wire Sash Cord10%
Sash Cord Attachments, per 100, \$2.00

Samson, Nos. 8 to 12:
Braided, 3 lb., Drab Cotton,
B. Drab, 40¢; E. White, 35¢;
50¢; Lined, 65¢; White Cot-
ton, 50¢; Spot Cord50¢

Massachusetts, White, 1/2 lb 40¢
Massachusetts, Drab, 1/2 lb 45¢
Phoenix, White, Nos. 8 to 1227¢

Silver Lake, per lb.:
A, Drab, 45¢; A, White, 40¢;
B, Drab, 40¢; E, White, 35¢;
Italian Hemp, 40¢; Lined, 57¢

See also Chain and Ribbon.

Wire, Picture—

Full Length90¢ @—
Short Length90¢ @ 20¢ @—

Hendryx Standard Wire Picture Cord,
90¢ @ 10%

Turner & Stanton Co. Wire Picture
Cord90%

Cradles—

Grain50%

Crayons—

White Round Crayons, Cases, 100
gro., \$5.00, \$8.50, \$9.00 and \$10.00
according to grade.

Zelnicke's Lumber:
White and Purple, Indelible\$7.50
Blue, Red, Green, Yellow and
Terra Cotta, \$6.50; Black, \$4.50

Giant Lumber, 5/4 in. x 15-16 in.
round, all colors, \$12.00; Indeli-
bles, \$14.00; Blacks, \$10.00

Genuine Soapstone, Metal Workers',
5 in. x 3/4 in. Round, \$2.50; 5 in. x
1/4 in. Square, \$1.75; 5 in. x 3/4 x 3-16,
\$2.50; 5 in. x 1/4 x 3-16, \$3.00

Suremark, Black, \$2.25; Blue, Red
and Yellow, \$2.50

Crooks, Shepherds—

American Fork & Hoe Co.:
Montana1/2 doz. \$1.50

Crow Bars—See Bars, Crow.**Cultivators—**

American Fork & Hoe Co.:
Victor Garden50¢ @ 10%

Cutlery, Table—

No. 12 M'd'm Knives, 1847, 1/2 doz. \$3.50
Star, Eagle, Rogers & Hamilton
and Anchor1/2 doz. \$3.00
Wm. Rogers & Son1/2 doz. \$2.50

Cutters—Glass—

H. H. Mayhew Co.40%
Red Devil60%
B. Mfg. Co.40%
Woodward50%

Meat and Food—

American30%
Nos. 401 402 403 404 405 406 407
Each\$5 \$7 \$10 \$12 \$25 \$50 \$60

Enterprise:
Nos. 5 10 12 22 32
Each\$2 \$3 \$2.75 \$4.50 \$6 25¢ @ 25¢ 7 1/2¢
No. 202, \$1.5040¢ @ 7 1/2¢

P. S. & W. Co.:
Ideal10¢ @ 10¢ @ 5%
Hale60¢ @ 5%
Little Giant1/2 doz. 40¢ @ 50¢
Nos. 305 310 312 320 322
\$35.00 \$48.00 \$44.00 \$72.00 \$68.00
New Triumph No. 405, 1/2 doz. \$24.00.
40%

Russwin Food, No. 1, \$24.00; No. 2,
\$27.00; 3, \$42.0045¢ @ 10¢ @ 10¢
\$15.00 \$18.00
Enterprise Beef Shavers25¢ @ 30%

Saw and Kraut—

Henry Diston & Sons:
Saw and Kraut Cutters35%
Corn Graters30%

J. M. Mast Mfg. Co.:
Saw Cutters, 1 Knife, 1/2 doz. \$3.00
Combined Saw Cutter and Corn
Grater1/2 doz. \$4.00

Tobacco—

All Iron, Cheapdoz. \$4.25 @ 4.50
Enterprise25¢ @ 30%
National, 1/2 doz., No. 1, \$21; No. 2,
\$1840%

Diggers, Post Hole, &c—

Diston's:
Rapid, 1/2 doz., \$24.0025%
Samson, 1/2 doz., \$34.0025%
Iwan's Pat. Post Hole and Well
Auger40%
Vaughan Pattern Post Hole Auger,
1/2 doz.\$7.00

Perfection Post Hole Diggers, 1/2
doz.\$8.50
Split Handle Post Hole Diggers,
1/2 doz.\$7.50

Hercules Pattern, 1/2 doz.\$9.50
Kohler's, 1/2 doz., Universal, \$14.00;
Little Giant, \$12.00; Hercules,
\$10.00; Invincible, \$9.00; Rival,
\$8.50; Pioneer, \$7.50

Never-Break Crucible Steel Post
Hole Diggers60%

Dividers—See Compasses.**Drawing Knives—**

See Knives, Drawing.

Dressers Emery Wheel—

Sterling Emery Wheel Dressers35%
Sterling Wheel Dresser Cutters35%

Drills and Drill Stocks—

Blacksmith's Common Drilling
Machines\$1.50 @ 1.75

Breast, Millers Falls15¢ @ 10¢
Breast, L. S. & W.33¢
C. & C. Ratchet25¢
Reversible Ratchet Die Stocks25¢
Goodell Automatic Drills, 50¢ @ 10¢ @ 60¢ @ 10¢
Millers Falls Automatic Drills,
Graves', per doz., Nos. 1, \$4.80;
2, \$8.16.

Millers Falls Automatic Drills, 33¢ @ 10¢
Ratchet, Curtis & Curtis25¢
Ratchet, Parker's50¢ @ 10¢
Ratchet, Weston's40¢
Ratchet, Weston's, Style H Im-
proved40¢ @ 10¢
Ratchet, No. 01240¢ @ 10¢
Ratchet, Celebrated40¢ @ 10¢
Ratchet, Whitney's, P. S. & W.40¢ @ 10¢ @ 50%

Star Drills50¢ @ 10¢
Star Pipe Drills50¢ @ 10¢
Star Drill Holders50¢ @ 10¢
Star Drill Points50¢ @ 10¢
Whitney's Adjustable, No. 10, \$12.00,
33 1/4%

Twist Drills—

Bit Stock70¢ @ 70¢ @ 10%
Taper and Straight Shank65¢ @ 65¢ @ 10%

Drivers, Screw—

Screw Driver Bits, per doz. \$5 @ 50¢
Balsey's Screw Holder and Driver, 1/2
doz., 2 1/2-in., \$6; 4-in., \$7.50; 6-in.,
\$9

Buck Bros', Screw Driver Bits30¢
Champion50¢
Diston's Screw Drivers, Handles
and Ferrules70%

Elmore Tool Mfg. Co.:
Elmore60%
Hartford66%
Indestructible55¢ @ 7¢
Standard Neverturn66%

Star
Screw Driver Bits25¢
Fray's Hol. H'dle Sets, No. 3, \$12.50;
Ford's Brace Screw Drivers, 40¢ @ 10¢
Gay's Double Action Ratchet35¢
Goodell's Auto65¢ @ 65¢ @ 10¢
Mayhew's Black Handle40%
Millers' Monarch40%
Millers Falls, 1/2 doz., Nos. 11, \$9.95;
12, \$13.75; 20, \$17.17; 21, \$18.40; 41,
\$13.43; 42, \$17.21.

Swan's:
Nos. 7565 to 7568, 60%; No. 7540,
40¢ @ 10%

Eave Trough, Galvanized—

Territory. Gal. Steel. Copper.

Northeastern75¢ @ 10¢ 50¢ @ 10%

Eastern80% 50¢ @ 10%

10-lb. cans, 7¢ 8¢
 10-lb. cans, less than 10¢ 10¢ 8¢
 Less quantity, 10¢ 10¢ 8¢
 NOTE.—In lots 1 to 3 tons a discount of 10% is given.

Extensions, Bit—
 Ford's Auger Bit Extensions.....45¢
Extractors, Lemon Juice—
 —See Squeezers, Lemon.

Fasteners, Blind—
 Zimmerman's Jap'd and Galv., 50¢
 5¢; Bronze and Plated.....50¢
 Walling's.....50¢
 Upson's Patent.....40¢

Cord and Weight—
 Ives, 1/2 doz., 10¢ 10¢
 Titan, 1/2 doz., 10¢ 10¢

Corrugated—
 Acme Corrugated Fasteners.....70%

Faucets—
 Cork Lined.....50¢ 10¢ 60¢
 Metallic Key, Leather Lined.....60¢ 10¢ 70¢
 Red Cedar.....40¢ 5¢ 10¢ 10¢ 45¢
 Petroleum.....70¢ 10¢ 75¢
 B. & L. B. Co.:
 Metal Key.....60¢ 10¢
 Star.....60¢
 West Lock.....50¢ 40¢
 John Sommer's Peerless Tin Key.....50¢
 John Sommer's Boss Tin Key.....50¢
 John Sommer's Victor Mtl. Key.....50¢ 10¢
 John Sommer's Duplex Metal Key.....60¢
 John Sommer's Diamond Lock.....40¢
 John Sommer's I. X. L. Cork Lined.....50¢
 John Sommer's Reliable Cork Lined.....50¢ 10¢
 John Sommer's Chicago Cork Lined.....50¢
 John Sommer's O. K. Cork Lined.....50¢
 John Sommer's No Brand, Cedar.....50¢
 John Sommer's Perfection, Cedar.....40¢
 Self Measuring:
 Enterprise, Self Measuring and Pump, 1/2 doz., 36¢ 10¢ 40¢ 10¢
 Lane's, 1/2 doz., 36¢ 10¢ 40¢ 10¢
 National Measuring, 1/2 doz., 36¢ 10¢ 40¢ 10¢

Felloe Plates—
 See Plates, Felloe.

Files—Domestic—
 List Nov. 1, 1899.

Best Brands.....70¢ 10¢ 75¢ 10¢
 Standard Brands.....75¢ 10¢ 80¢
 Lower Grade.....75¢ 10¢ 80¢ 10¢
 Disston's Superfine.....60¢
 Gold Medal.....70¢
 McCaffrey's American Standard.....60¢ 10¢ 10¢

Imported—
 Stubbs' Tapers, Stubbs' List, July 24, '97.....33 1/2 40%

Fixtures, Fire Door—
 Richards Mfg. Co.:
 Universal, No. 102; Special, No. 104.....43.75
 Fusible Links, No. 96.....50¢
 Expansion Bolts, No. 107.....60¢ 10¢

Grindstone—
 Net Prices:
 Inch.....15 17 19 21
 Per doz.....\$3.60 3.85 4.15 4.65
 Peck, Stow & Wilcox Co.:
 In.....15 17 19 21 24
 \$1.00 4.40 4.75 5.50 6.50.....30%
 Reading Hardware Co.....60%

Fodder Squeezers—
 See Compressors.

Forks—
 American Fork & Hoe Co.:
 Iowa Dig-Ezy Potato.....70¢ 5¢
 Hay, Regular, 3-tine.....65¢ 20¢ 12 1/2¢
 Hay, Regular, 4-tine.....60¢ 7 1/2¢ 45¢
 Champion, Hay.....60¢ 12 1/2¢
 Acme, Hay.....60¢ 20¢
 Manure, Regular, 4-tine.....65¢ 5¢
 Manure, Regular, 5 and 6 tine.....70¢
 Champion, Manure.....65¢ 5¢
 Columbia, Manure.....70¢
 Acme, 4-tine.....60¢ 10¢ 45¢
 Round Shoulder Header, 4-tine.....65¢
 Champion, Header.....65¢
 Dakota, Header.....65¢
 Kansas Header.....65¢
 Wood, Barley.....35¢ 5¢
 Steel, Barley.....60¢
 Columbia, Spading.....70¢ 7 1/2¢ 45¢

Frames—Wood Saw—
 White, S'gt Bar, per doz. 75¢ 80¢
 Red, S'gt Bar, per doz. \$1.00 1.25
 Red, Dbl. Brace, per doz. \$1.10 1.50

Freezers, Ice Cream—
 Qt.....1 2 3 4 6
 Luch.....\$1.25 \$1.60 \$1.90 \$2.20 \$2.50

Fruit and Jelly Presses—
 See Presses, Fruit and Jelly.

Fry Pans—See Pans, Fry.

Fuse—Per 1000 Feet.
 Hcrup.....\$2.75
 Cotton.....3.20
 Waterproof Sgl. Taped.....3.65
 Waterproof Dbl. Taped.....4.40
 Waterproof Tpl. Taped.....5.15

Gates, Molasses and Oil—
 Stebbins' Pattern.....80¢ 90¢ 45%

Gauges—
 Marking, Mortise, etc., 50¢ 50¢ 10¢
 Chapin-Stephens Co.:
 Marking, Mortise, etc., 50¢ 50¢ 10¢
 Disston's Marking, Mortise, etc., 50¢ 50¢ 10¢
 Wire, Brown & Sharpe's.....50¢
 Wire, Morse's.....50¢
 Wire, P. S. & W. Co.....30%

Gimlets—Single Cut—
 Numbered assortments, per gro.

Nail, Metal, No. 1, \$2.00; 2, \$2.30
 Spike, Metal, No. 1, \$1.00; 2, \$1.30
 Nail, Wood Handled, No. 1, \$2.30; 2, \$2.60
 Spike, Wood Handled, No. 1, \$1.30; 2, \$1.60

Glass, American Window—
 See Trade Report.

Glasses, Level—
 Chapin-Stephens Co.....65¢ 65¢ 10¢
 Disston & Sons.....60¢ 10%

Glue, Liquid Fish—
 Bottles or Cans, with Brush, 25¢ 10¢ 50%

Elwell's.....50%

Grease, Axle—
 Common Grade.....gro. \$6.00 10¢ 50¢
 Dixon's Everlasting, 10-lb. pails, ea. 85¢; in boxes, 1/2 doz., 1 lb. \$1.20; 2 lb. \$2.00
 Helmet Hard Oil.....25%

Griddles, Soapstone—
 Pike Mfg. Co.....33 1/2 33 1/2 10%

Grinders—
 Pike Mfg. Co.:
 Hand and Foot Power, Pyko Nos. 1, 2, 3; Pyko Primo; Pyko Peerless; Pyko Spiral (foot power); 33 1/2%
 Mower Knife and Tool, \$5.00. 40¢ 10%
 Royal Mfg. Co.:
 Hand and Foot Power, each, Nos. 01, \$1.75; 1A, \$2.50; 10, \$5.00
 Sickle Grinders, each, Nos. 20, \$5.00; 20A, \$6.00; 20A Combined, \$6.50
 Disc Grinders, each, \$2.50.....40%

Grindstones—
 Pike Mfg. Co.:
 Improved Family Grindstones, 1/2 inch, 1/2 doz., \$2.00.....33 1/2%
 Richards Mfg. Co.: Eli and Cycle Ball Bearing, mounted.....40%

Grips, Nipple—
 Perfect Nipple Grips.....40¢ 10¢ 2%

Halters and Ties—
 Cow Ties.....70¢ 10¢ 40%
 Bridgeport Chain Co.:
 Triumph Coil and Halters, 35¢ 2 1/2 40%
 Brown Coil and Halters.....45¢ 50¢ 45%
 Brown Cow Ties.....50¢ 55¢ 10¢ 45%
 Brown Tie Outs.....70¢ 10¢ 75¢ 45%
 Covert Mfg. Co.:
 Web.....30¢ 2%
 Jute Rope.....35¢
 Sisal Rope.....20%
 Cotton Rope.....45%
 Hemp Rope.....45%
 Oneida Community:
 Am. Coil and Halters.....40¢ 40¢ 45%
 Am. Cow Ties.....45¢ 50%
 Niagara Coil and Halters.....45¢ 50%
 Niagara Cow Ties.....45¢ 45¢ 50¢ 10¢ 45%

Hammers—
 Handled Hammers—
 Heller's Machinists'.....55¢ 10¢ 45¢ 10¢ 5%
 Heller's Carriers.....40¢ 45¢ 10¢ 45%
 Peck, Stow & Wilcox Co.:
 Crucible Steel.....40¢ 10¢ 50%
 Farriers'.....40¢ 10¢ 50%
 Riveting.....40¢ 10¢ 50%
 Machinists'.....60¢ 25%
 Blacksmiths'.....50%
 Elmore Shoemakers' Hammers.....75%
 Fayette H. Plumb:
 A. E. Nail.....40¢ 2 1/2 40¢ 12 1/2%
 Eng. and B. S. Hand.....50¢ 10¢ 50¢ 45%
 Machinists' Hammers.....60¢ 10¢ 45%
 Rivet and Tinner's.....40¢ 7 1/2 40¢ 12 1/2 45%
 Victor Magnetic Tack, 1/2 doz., \$1.75

Heavy Hammers and Sledges—
 Under 3 lb., per lb., 50¢.....80¢ 10%
 3 to 5 lb., per lb., 40¢.....80¢ 10¢ 10%
 Over 5 lb., per lb., 30¢.....80¢ 10%
 Over 10 lb., per lb., 30¢.....80¢ 10¢ 10%

Handles—
 Agricultural Tool Handles
 Axe, Pick, etc., 60¢ 10¢ 60¢ 10¢ 45%
 Hoe, Rake, etc., 40%
 Fork, Shovel, Spade, etc.:
 Long Handles.....40%
 D Handles.....40%

Cross-Cut Saw Handles—
 Atkins'.....40%
 Disston's Handles and Saw Tabs.....45%

Mechanics' Tool Handles—
 Auper, assorted.....gro. \$1.00 10¢ 33 1/2%
 Brad Axl.....gro. \$1.65 10¢ 17 1/2%
 Chisel Handles, Ass'd, per gro.:
 Tanged Firmer, Apple, \$2.40 10¢
 \$2.45; Hickory.....\$2.13 10¢ 12 1/2%
 Socket Firming, Apple, \$1.75 10¢
 \$1.95; Hickory.....1.60 10¢ 17 1/2%
 Socket Framing, Hickory.....\$1.60 10¢ 17 1/2%

File, assorted.....gro. \$1.30 10¢ 17 1/2%
 Hammer, Hatchet, etc., 60¢ 10¢ 60¢ 10¢ 45%
 Hand Saw, Varished, doz., 80¢
 85¢; Not Varished.....65¢ 75¢
 Plane Handles:
 Jack, doz., 30¢; Fore, doz., 45¢
 Chapin-Stephens Co.:
 Carving Tool.....30¢ 30¢ 10%
 Chisel.....80¢ 60¢ 10%
 File and Awl.....60¢ 60¢ 10%
 Saw and Plane.....30¢ 30¢ 10%
 Screw Driver.....30¢ 30¢ 10%
 Millers Falls Adj. and Ratchet Auger Handles.....15¢ 10%
 Nicholson Simplicity.....1/2 doz. \$1.50

J. L. Osmond:
 Indestructible File and Tool, 1/2 doz., No. 1, \$5.00; No. 2, \$6.50; No. 3, \$9.00; No. 4, \$9.50; No. 5, \$10.00.....gro. lots 10%

W. A. Zelnicher Supply Co.:
 Hammer, 1/2 doz., 12 in., \$2.00; 14 in., \$2.00; 16 in., \$2.30; 18 in., \$2.50; 20 in., \$2.70; 22 in., \$3.00; 24 in., \$3.30; 26 in., \$3.50; 30 in., \$3.80.

Sledge, 1/2 doz., oval, 30 in., \$3.50; octagon, 30 in., \$3.80; oval, 36 in., \$4.00; octagon, 36 in., \$4.50.

Axe, 1/2 doz., 28 to 34 in., \$5.00; 36 in., \$5.80.

Adze, 1/2 doz., 36 in., \$5.80; 36 in., \$7.80.

Pick, 1/2 doz., R. R., 36 in., \$8.00; coal, 31 in., \$5.80.

Hatchet, 1/2 doz., 12 to 14 in., \$2.00.

Hangers—
 NOTE.—Barn Door Hangers are generally quoted per pair, without track and Parlor Door Hangers per audible set with track, etc.

Chicago Spring Butt Co.:
 Friction.....25%
 Oscillating.....25%
 Big Twin.....25%
 Chisholm & Moore Mfg. Co.:
 Baggage Car Door.....50%
 Elevator.....30%
 Railroad.....50%
 Crane & Carrier Mfg. Co.:
 Roller Bearing.....60¢ 19%
 Roller Bearing.....70%
 Grillon Mfg. Co.:
 Solid Axle, No. 10, \$12.00. 60¢ 10%
 Roller Bearing, No. 11, \$15.00. 60¢ 10%
 Roller Bearing, No. 12, \$18.00. 60¢ 10%
 Bull Dog, \$24.00.....70%
 Lane Bros. Co.:
 Parlor, Ball Bearing, \$1.00;
 Standard, \$3.15; No. 105, \$2.85;
 New Model, \$2.80. New Champion per set of 4 Hangers, complete with track.....\$2.25
 Barn Door, Standard.....\$6.00
 Hinged.....net \$0.08
 Covered.....60¢ 5%
 Special.....70¢ 5%
 Trolley Hangers and track.....50%
 Lawrence Bros.:
 Cleveland.....70¢ 7 1/2%
 Clipper, No. 75.....60%
 Crown.....35¢ 10%
 Cyclone, No. 60, net \$5.50
 Tandem, No. 60.....net \$7.50
 New York.....53¢ 10%
 Trolley, No. 30, 1/2 pair.....\$1.25
 McKinney Mfg. Co.:
 Roller Bearing, Nos. 1 and 2.....70%
 Anti-Friction.....60%
 Hinged Hangers, King Charn.....60%
 Richards Mfg. Co.:
 Hangers, Nos. 47, 48, 147, 217, 60¢ 5%
 Pioneer Wood Track, No. 3, \$3.25
 Roller B'g St'l Track No. 12, \$2.20
 Roller B'g St'l Track No. 13, \$2.50
 Roller B'g, Nos. 39, 41, 43, 70¢ 1 1/2%
 Hero, Adj. Track No. 19, 50¢ 10%
 Adjustable Track Tandem Trol.....50%
 Key Track No. 16.....50¢ 10%
 Seal, Steel Track No. 8.....42¢ 25%
 Auto Adj. Track No. 22, 50¢ 45%
 Trolley B. D. No. 17, \$1.25; F. D. No. 120, \$2.25; No. 121, \$2.45; No. 150.....\$2.50
 Safety Underwriters F. D. No. 101.....\$4.00
 Tandem No. 41, 2 1/2 and 3 1/2 10%
 Palace, Adjustable Track No. 132.....50¢ 45%
 Royal, Adjustable Track No. 122.....50¢ 10%
 Ives' Wood Track No. 1.....\$2.25
 Trolley B. D. No. 20.....50¢ 10%
 Trolley B. D. No. 24, \$1.30; No. 27, \$1.40; No. 28, 39¢
 Roller Bearings, Nos. 37, 38, 39, 41, 43, 44, Sizes 1 and 2, 70¢ 7 1/2%
 Anti-friction, No. 42; No. 44, sizes 2 1/2 and 3.....60%
 Hinged Tandem No. 46.....60¢ 45%
 Folding Door B. B. Swivel No. 135.....40%
 Taylor & Rogers, P. Y. Co., Kidder's Roller Bearing, 1/2 doz., 4 in., \$12.00; 5 in., \$14.00. 60¢ 10%
 Myers' Stayon Hangers.....60%

Hangers—Garment—
 Pullman Trouser, 1/2 doz., No. 1 \$9.00; No. 4, \$21.00; No. 5, \$16.50; No. 8, Black Enamel, \$7.50; No. 10, \$21.00; No. 12, \$8.00; No. 15, Rods, \$9.00; No. 18, Loops.....\$10.00
 Victor Folding.....1/2 doz. \$9.60

Gate—
 Myers' Patent Gate Hangers, 1/2 doz., net.....50%
 Joist and Timber—
 Lane Bros. Co.....35%

Hasps—
 Grillon's Security Hasp.....50¢ 10%
 McKinney's Perfect Hasp, 1/2 doz., 60%

Hatchets—
 Regular Hat, first qual. 50¢ 10¢ 60%
 Second quality.....60¢ 60¢ 10%

Heaters, Carriage—
 Clark, No. 5, \$1.25; No. 5B, \$1.50; No. 3, \$1.75; No. 3D, \$2.00; No. 7D, \$2.25; No. 3E, \$2.50; No. 1, \$3.00.....25%
 Clark Coal, 1/2 doz., \$0.75.....20%

Hinges—
 Blind and Shutter Hinges
 Surface Gravity Locking Blind:
 Doz. Sets with Fastenings, No. 1, \$0.70; No. 8, \$1.25; No. 5, \$2.65.
 Mortise Reverser.....80%
 Mortise Shutter.....80%
 North's Automatic Blind Fixtures, No. 2, for Wood, \$9.00; No. 3, for Brick, \$11.50.....10%
 Charles Parker Co.....70¢ 75%
 Parker Wire Goods Co.,
 Hale & Benjamin Automatic Blind Hinges.....30%
 Hale's Blind Awning Hinges, No. 110, for wood, \$9.00; No. 111, for brick, \$9.00.....20%

Reading's Gravity.....60%
 Stanley's Steel Gravity Blind Hinges, No. 1647 1/2, 1/2 doz. sets, without screws, \$0.05; with screws, \$1.25.
 Wrightsville Hardware Co.:
 O. S. Lull & Porter.....75¢ 5%
 Acme, Lull & Porter.....75%
 Queen City Reversible.....75%
 Shepard's Noiseless, Nos. 60, 65, 66.....75¢ 5%
 Niagara, Gravity Locking, Nos. 1, 3 & 5.....75¢ 5%
 Clark's O. P., No. 1.....75¢ 10%
 Clark's O. P., Nos. 3 and 5.....75¢ 5%
 Tip Pat'n, No. 1.....75¢ 10%
 Clark's No. 3.....75¢ 5%
 Buffalo Gravity Locking, Nos. 1, 3 & 5.....70¢ 10¢ 45%
 Shepard's Double Locking.....75%
 Champion Gravity Locking.....75¢ 5%
 Pioneer.....75¢ 10%
 Empire.....65%
 W. H. Co.'s Mortise Gravity Locking, No. 2.....60¢ 10%

Gate Hinges—
 Clark's or Shepard's—Doz. sets:
 No. 1.....2 3
 Hinges with L't'chs.....\$2.00 2.70 5.00
 Hinges only.....1.25 1.90 3.50
 Latches only.....70 75 35
 New England:
 With Latch.....doz. @ \$2.00
 Without Latch.....doz. @ \$1.60
 Reversible Self-Closing:
 With Latch.....doz. @ \$1.75
 Without Latch.....doz. @ \$1.35
 Western:
 With Latch.....doz. \$1.75
 Without Latch.....doz. \$1.15
 Wrightsville Hardware Co.:
 Shepard's or Clark's Hinges and Latches, Hinges only or Latches only, Nos. 1, 2 or 3.....70%

Miscellaneous—
 Griffin Mfg. Co., Fleur de Lis Surface Hinges, 1/2 doz., pr.....\$1.00

Pivot Hinges—
 Bommer Bros. Pivot, Ball Bearing.....40%
 Lawson Mfg. Co., Matchless.....30%

Spring Hinges—
 Holdback, Cast Iron.....\$6.75 10¢ 67.00
 Non-Holdback, Cast Iron.....\$6.50 10¢ 67.75
 J. Bardsley:
 Bardsley's Non-Checking Mortise Floor Hinges.....40%
 Bardsley's Patent Checking.....33 1/2%
 Bommer Bros.:
 Spring Butt Hinges.....40%
 Surface Floor, Ball Bearing.....40%
 Mortise Floor, Ball Bearing.....40%
 Lavatory Hinges.....40%
 Non-Holdback Screen Door, Nos. 2000 and 900.....\$12.00
 Holdback Screen Door, No. 999.....1/2 doz. \$9.00
 Chicago Spring Butt Co.:
 Chicago Spring Hinges.....25%
 Triple End Spring Hinges.....50%
 Chicago (Ball Bearing) Floor.....50%
 Garden City Engine House.....25%
 Keene's Saloon Door.....25%
 Columbian Hardware Co.:
 Acme, Wrought Steel.....30%
 Acme, Brass.....25%
 American.....30%
 Columbia, 1/2 gr., No. 14, \$9.00; No. 18.....\$25.00
 Columbia, Adj., No. 7, 1/2 gr. \$12.00
 Gem, new list.....30%
 Clover Leaf and Acorn, per gro., new list.....\$12.00
 Oxford, new list.....30%
 Floor Spring Hinges.....65¢ 10%
 Columbian Steel.....65¢ 10%
 Lawson Mfg. Co.:
 Matchless Spring Hinges.....30%
 Matchless Jamb Hinges.....30%
 Richards Mfg. Co.:
 Superior Double Acting Floor Hinges.....40%
 Shelby Spring Hinge Co.:
 Buckeye All Steel Holdback Screen Door.....1/2 gr. \$9.00
 Chief Ball Bearings Floor Hinge.....50%
 Ball Bearing Door.....25%
 No. 77, Sheet Steel Holdback, 1/2 gr., pr.....\$9.00
 Standard Mfg. Co.:
 Champion Double Acting Door Hinge.....25¢ 10¢ 10%
 Standard Double Acting Floor Hinge.....25¢ 10¢ 10%
 Superior Spring Hinge Co.:
 Superior Floor Hinges.....40%
 Spring Hinges.....40%

Wrought Iron Hinges—
 Strap and T Hinges, etc., list February 10, 1908:
 Light Strap Hinges.....65%
 Heavy Strap Hinges.....75%
 Light T Hinges.....60%
 Heavy T Hinges.....40¢ 10%
 Extra Heavy T Hinges.....65¢ 10%
 Hinge Hasps.....40%
 Cor. Heavy Strap.....75%
 Cor. Ex. Heavy T.....65¢ 10%
 Screw Hook 6 to 2 1/2 in. 1b. 3 1/2¢
 and Strap 1 1/2 to 2 1/2 in. 1b. 3 1/2¢
 2 1/2 to 3 1/2 in. 1b. 3 1/2¢
 3 1/2 to 4 1/2 in. 1b. 4 1/2¢
 4 1/2 to 5 1/2 in. 1b. 5 1/2¢
 5 1/2 to 6 1/2 in. 1b. 6 1/2¢
 6 1/2 to 7 1/2 in. 1b. 7 1/2¢
 7 1/2 to 8 1/2 in. 1b. 8 1/2¢
 8 1/2 to 9 1/2 in. 1b. 9 1/2¢
 9 1/2 to 10 1/2 in. 1b. 10 1/2¢
 10 1/2 to 11 1/2 in. 1b. 11 1/2¢
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 59 1/2 to 60 1/2 in. 1b. 60 1/2¢
 60 1/2 to 61 1/2 in. 1b. 61 1/2¢

Hoes— Eye —

Scovill and Oval Pattern.
60¢ 10¢ 60¢ 10¢ 10¢
Grub, list Feb. 23, 1899.
70¢ 10¢ 70¢ 10¢ 10¢
D. & H. Scovill.....27½¢
Am. Fork & Hoe Co. (Scovill Pat-
tern).....60¢ 5¢

Handled—

Cronk's Weeding, No. 1, \$2.00; No. 2, \$2.50
Star Double Bit.....\$2.50
American Fork & Hoe Co.:
Regular, Cotton.....75¢ 10¢ 5¢ 2½¢
Crescent, Cultivator.....75¢ 2½¢
Mattock, Senior.....70¢
Mattock, Junior.....50¢
Sprouting.....50¢
Tobacco, Harper's.....66¢ 15¢ 10¢
Warren.....55¢ 10¢ 10¢ 5¢
Ivanhoe.....65¢ 15¢ 10¢
Cultivator, B B 6.....70¢ 10¢ 10¢ 5¢
Cultivator, B B 6½.....70¢ 10¢ 10¢ 5¢
Weeding, Acme.....72¢ 10¢ 10¢ 5¢
Scuffle, Lightning.....60¢ 5¢

Hoisting Apparatus—

See **Machines, Hoisting.**

Holders— Bit—

Angular, ½ doz., \$24.00.....45¢ 10¢

Door—

Bardsley's, Iron, 40%; Brass and
Bronze.....25¢
Empire.....60¢
Pullman.....25¢
Richards Mfg. Co.: No. 117, Ever-
ready, 40%; Nos. 118, 119, Sure
Grip.....50¢
Superior.....40¢

File and Tool—

Nicholson File Holders and File
Handles.....33½¢ 40¢

Fruit Jar—

Triumph Fruit Jar Holder, ½ gross,
\$18.00; ½ doz.....\$2.00

Trace and Rein—

Fernald Double Trace Holder, ½ doz.,
pairs.....\$1.25
Dash Rein Holder, ½ doz.....\$1.25

Hones—Razor—

Pike Mfg. Co., Belgian and Swat,
50%; German.....33½¢

Hooks—Cast Iron—

Bird Cage, Reading.....40¢
Clothes Line, Reading List.....40¢
Coat and Hat, Reading.....45¢ 20¢
Coat and Hat, Wrightsville.....60¢ 5¢
Harness, Reading List.....40¢

Wire—

Belt, Nos. 1 to 15.....75¢ 10¢ 80¢
Wire O. & H. Hooks.....80¢ 80¢ 10¢
Bradley Metal Clasp Wire, Coat and
Hat.....75¢ 10¢ 80¢
Columbian Hwy. Co., Gem.....75¢ 10¢
Parker Wire Goods Co., King.....75¢ 10¢
Wire Goods Co.:
Acme, 60¢ 10¢; Chief, 70¢ 10¢;
Crown, 55¢; Czar, 65¢ 10¢; V
Brace, 75¢; Czar Harness, 50¢;
Ceiling, 75¢.

Wrought Iron—

Box, 6 in., per doz., \$0.90; 8 in.,
\$1.15.
Cotton.....dos. \$1.25 \$1.50
Wrought Staples, Hooks, &c.,
See Wrought Goods.

Miscellaneous—

Hooks, Bench, see **Stops, Bench.**
Bush, Light, doz., \$6.20; Medium,
\$6.75; Heavy, \$7.65
Grass, best, all sizes, per doz.,
\$2.75 \$3.00
Grass, common grades, all sizes,
per doz.....\$1.25 \$1.50
Whiffletree.....lb. 53¢ 66¢
Hooks and Eyes:
Brass.....60¢ 60¢ 10¢
Malleable Iron.....70¢ 70¢ 10¢
Covert Mfg. Co. Gate and Scuttle
Hooks.....40¢
Turner & Stanton Co. Cup and
Shoulder.....85¢ 10¢
Bench Hooks—See **Bench Stops.**
Corn Hooks—See **Knives, Corn.**

Horse Nails—

See **Nails, Horse.**

Horseshoes—

See **Shoes, Horses.**

Hose, Rubber—

Garden Hose, ¾-inch:
Competition.....ft. 6¢ 6½¢
3-ply Guaranteed.....ft. 8½¢ 9¢
4-ply Guaranteed.....ft. 9½¢ 12¢
Cotton Garden, ¾-in., coupled:
Low Grade.....ft. 8¢ 9¢
Fair Quality.....ft. 10¢ 11¢

Irons— Sad—

From 4 to 10.....lb. 2½¢ 2½¢ 4¢
B. B. Sad Irons.....lb. 3½¢ 3½¢
Mrs. Potts, cents per set:
Nos. 50 55 60 65
Jap'd Caps.....35 93 95 93
Tin'd Caps.....91 88 1.01 96
New England Pressing.....lb. 3½¢ 4¢

Bar and Corner—

Richards Mfg. Co., Bar, 60¢ 10¢;
Corner.....60¢

Pinking—

Pinking Irons.....dos. 60¢ 65¢

Irons, Soldering

See **Coppers.**

Jacks, Wagons—

Covert Mfg. Co.:
Auto Screw.....30¢ 2½¢; Steel, 45¢
Lockport.....50¢
Lane's Steel.....30¢ 5¢
Richards' Tiger Steel, No. 130.....50¢ 10¢
Smith & Hemenway Co.'s.....25¢

Ladder—

Richards Mfg. Co., Ladder Jacks.....5½¢

Jointers—

Pike Mfg. Co., Saw Jointers, \$7.00. 40%

Kettles—

Brass, Spun, Plain.....20¢ 25¢
Enameled and Cast Iron—See **Ware,**
Hollow.

Knives—

Butcher, Kitchen, &c.—
Foster Bros' Butcher, &c.....30¢
Wilkinson Shear & Cutlery Co.....60%

Corn—

Columbian Cutlery Co., Wilcutt
Brand Knives and Hooks.....60%

American Fork & Hoe Co.:
Easy Cut, ½ doz., No. 10 C H.....\$2.10
Easy Cut, ½ doz., No. 10 B C H.....\$2.20
Acme, ½ doz.....\$2.35
Dent, ½ doz.....\$2.35
Adjustable, Serrated, ½ doz.....\$1.90
Serrated, ½ doz.....\$1.85
Yankee, No. 1 C H.....\$1.35
Yankee, No. 2 C H.....\$1.15

Drawing—

Standard List.....80¢ 10¢—%
C. E. Jennings & Co., Nos. 45, 46,
25¢ 7½¢

Jennings & Griffin, Nos. 41, 42,
66¢ 7½¢

Swan's.....66¢ 7½¢

Watsons.....16½¢

L. & I. J. White.....20¢ 5¢ 25¢

Hay and Straw—

Serrated Edge, per doz. \$5.00 \$5.50
Ivan's Sickle Edge.....\$9.50
Ivan's Serrated.....\$10.00

Miscellaneous—

Farriers'.....dos. \$2.60 \$3.53
Westenholm's.....½ doz. \$3.00 \$3.25

Knobs—

Base, 2½-inch, Birch or Maple,
Rubber Tip.....gro. \$1.25 \$1.40

Carriage, Jap., Drive, all sizes,
gro. 35¢ 40¢

Door, Mineral.....dos. 65¢ 70¢

Door, Por. Jap'd.....dos. 70¢ 75¢

Door, Por. Nickel.....dos. \$2.05 \$2.15

Bardsley's Wood Door, Shutters, &c. 15%

Lacing, Leather—

See **Belting, Leather.**

Ladders, Store, &c.—

Lane's Store.....25¢
Myers' Noiseless Store Ladders.....50%

Richards Mfg. Co.:
Improved Noiseless, No. 112.....50%

Climax Shelf, No. 113.....50%

Trolley, No. 109.....50%

Ladies, Melting—

L. & G. Mfg. Co., Melting and
Plumbers'.....25¢

P. S. & W.....40¢ 10¢

Reading.....60%

Lamps—

Hammer's M. I. Hand.....45%

Lanterns—Tubular—

Regular, No. 0.....dos. \$4.00 \$4.50

Slide Lift, No. 0.....dos. \$4.25 \$4.75

Hinge Globe, No. 0.....dos. \$4.25 \$4.75

Other Styles.....40¢ 5%

Bull's Eye Police—

3-inch.....\$3.75 \$4.00

Latches—Thumb—

Roggin's Latches, Jap'd, with
Screws.....dos. 35¢ 40¢

Door—

Cronk & Carrier Mfg. Co., No. 101,
Richards' Bull Dog, Heavy, No.
125.....50¢ 53¢

Richards' Trump, No. 127.....\$1.30

Leaders, Cattle—

Small.....dos. 50¢; large, 60¢

Covert Mfg. Co.:
Cotton, 45%; Hemp, 45%; Jute,
35%; Sisal, 20%.

Leathers, Pump—

See **Pumps.**

Lifters, Transom—

R. & E.....10%

Lines—

Wire Clothes, Nos. 18 19 20
100 feet.....\$2.30 1.95 1.75
75 feet.....\$1.95 1.65 1.50

Samson Cordage Works:
Solid Braided Chalk, Nos. 0 to 3, 40%
Solid Braided Masons'.....30%

Silver Lake Braided Chalk, No. 0,
\$6.00; No. 1, \$4.50; No. 2, \$7.00; No.
3, \$7.50.....\$7.20

Masons' Lines, Shade Cord, &c.:
White Cotton, No. 3½, \$1.50; No. 4,
\$2.00; No. 4½, \$2.50; Colors, No. 3½,
\$1.75; No. 4, \$2.25; No. 4½, \$2.75;
Linen, No. 3½, \$2.50; No. 4, \$3.50;
No. 4½, \$4.50.....20%

Tent and Awning Lines: No. 5,
White Cotton, \$7.50; Drab Cotton,
\$8.50.....20%

Clothes Lines, White Cotton: 50 ft.,
\$2.75; 60 ft., \$3.25; 70 ft., \$3.75; 75
ft., \$4.00; 80 ft., \$4.25; 90 ft., \$4.75;
100 ft. \$5.25.....20%

Turner & Stanton Co.:
Solid Braided Chalk, Masons' and
Clothes Lines.....40%

Clothes Lines, White Cotton.....20%

Shade Cord, Cotton or Linen.....20%

Locks— Cabinet—

Cabinet Locks.....\$3½¢ 3½¢ 45%

Door Locks, Latches, &c —

NOTE.—Net Prices are very often made
on these goods.

Reading Hardware Co.....40%

R. & E. Mfg. Co.....10%

Padlocks—

R. & E. Mfg. Co., Wrought Steel and
Brass.....75¢ 10%

Sash, &c.—

Ives' Patent:
Crescent.....10%

Automatic Gravity Metal Sash, ½
gro., \$149.58.....10%

Window Ventilating.....10%

Pullman Patent Ventilating Lock.....25%

Reading Sash Locks.....40%

Taylor Mfg. Co., Perfect Ventilating,
½ doz.....\$0.75 \$1.00

Machines—Boring—

Com. Up'r't, without Augers,
\$2.00 \$2.25

Com. Ang'l'r, without Augers,
\$2.25 \$2.50

Ford Auger Bit Co.....\$2.00

Jennings Nos. 1 and 4.....\$2.75

Millers' Falls.....5.75

Snell's, Upright, \$2.65; Angular, \$2.00

Swan's Improved.....10¢ 10%

Corking—

Reisinger Invenible Hand Power.....
½ doz. \$48.00

Fence—

Williams' Fence Machines.....each, \$5.50

Hoisting—

Moore's Anti-Friction Chain Hoist, 30%
Moore's Hand Hoist, with Lock
Brake.....20%

Moore's Cyclone High Speed Chain
Hoist.....25%

Ice Cutting—

Chandler's.....12½%

Washing

Boss Washing Machine Co.: Per doz.
Boss No. 1.....\$57.00

Boss Rotary.....\$57.00

Champion Rotary Banner No. 1.....\$57.00

Standard Champion No. 1.....\$50.00

Standard Perfection.....\$27.00

Cincinnati Square Western.....\$33.00

Uneda American, Round.....\$33.60

Mallets—

Hickory.....45¢ 50%

Lignumvite.....45¢ 50%

Tinners' Hickory and Apple-
wood.....dos. 45¢ 50%

Mangers, Stable—

Swett Iron Works.....50%

Mats, Door—

Acme Flexible Steel.....50%

Elastic Steel (W. G. Co.), new list.....50%

Everlasting Flexible Steel.....33½%

Mattocks—

See **Picks and Mattocks.**

Milk Cans—See Cans, Milk.**Mills, Coffee, &c.—**

Enterprise Mfg. Co.:
Coffee.....20¢ 25%

Shell and Corn.....25¢ 10%

National list Jan. 1, 1902.....30%

Parker's Columbia and Victoria.....33½%

Parker's Box and Side.....50¢ 10%

Swift, Lane Bros. Co.....30%

Motors, Water—

Divine's Red Devil.....30%

\$2.50 3.50 10.00 15.00.....33½%

No. 1 2 3 4

Lippincott's:
No.....1 2 3 4

\$2.50 3.50 10.00 15.00.....33½%

Pike Mfg. Co., Tool and Knife
Grinding.....33½%

Mowers, Lawn—

NOTE.—Net prices are generally quoted
Cheapest, 10-in., \$8.00; advance
10¢ for each size.

Cheap, 10-in., \$2.25; advance 15¢
20¢ for each size.

Better Grade, 10-in., \$3.00; ad-
vance 25¢ for each size.

12 14 16 18 in.
High Grade.....\$1.50 4.75 5.00 5.25

Continental.....60%

Great American.....70%

Great American Ball B'r'g, new list.....70%

Quaker City.....70%

Pennsylvania.....60%

Pennsylvania, Jr., Ball Bearing.....
\$0.60 \$0.85

Pennsylvania Golf.....50%

Pennsylvania Horse.....33½¢ 5%

Pennsylvania Pony.....40¢ 5%

Nails—

Wire Nails and Brads, Miscel-
laneous.....85¢ 85¢ 10%

Cut and Wire. See **Trade Report.**

Hungarian, Finishing, Upholster-
ers, &c. See **Tacks.**

Horse—

Nos. 6 7 8 9 10
Anchor.....23 21 20 19 18 .. 30 lb.

Coleman.....13 12 11 11 net 30 lb

New Haven.....23 21 20 19 .. 30 lb.

Livingston.....19 18 17 16 16 .. 12¢

Western.....10%

Jobbers' Special Brands.....
per lb. 9¢

Picture—

Brass Hd. gro. 45 55 60 70
Por. Head, gro. .. 1.10 1.10 1.10

Upholsters—

Brass Plated.....30%

Plated.....30¢ 10%

Nippers—

See **Pliers and Nippers.**

Nipples—

Standard Nipple Co.:
Wrought Pipe Nipples.....80%

Nuts— Blank or Tapped.

Cold Punched: Off list.
Square.....5

Sausage Stuffers or Fillers
See *Stuffers or Fillers, Sausage.***Saw Frames—**
See *Frames, Saw.***Saw Sets—See Sets, Saw.****Saw Tools—See Tools, Saw.****Saws—**

Atkins':	
Circular	45
Band	50@50&10
Butcher Saws	50
Cross Cuts	35
One-Man Cross Cut	40
Narrow Cross Cut	50
Hand, Rip and Panel	35&45
Miter Box and Compass	45
Mulay, Mill and Drag	45
Wood Saws	40&10
Chapin-Stephens Co.:	
Turning Saws and Frames	30@30&10
Diamond Saw & Stamping Works:	
Sterling Kitchen Saws	30&10&10
Diston's:	
Circular, Solid and Inset Tooth	50
Band, 2 to 18 in. wide	60
Band, 4 to 14	60
Crosscuts	45
Narrow Crosscuts	50
Mulay, Mill and Drag	40
Framed Woodsaws	25
Woodsaw Blades	25
Woodsaw Rods, Tinned	15
Hand Saws, Nos. 12, 99, 9, 16, 4100	25
Do, 120, 76, 77, 8	25
Hand Saws, Nos. 7, 107, 107 1/2, 3, 1	25
0, 00, Combination	30
Compass, Key Hole, &c.	45
Hand Ice Saws	45
Butcher Saws and Blades	30
C. E. Jennings & Co.'s:	
Back Saws	16
Butcher Saws	25&7 1/2
Compass and Key Hole Saws	33&7 1/2
Framed Wood Saws	25&7 1/2
Hand Saws	12 1/2
Wood Saw Blades	33&7 1/2
Millers Falls:	
Butcher Saws	15&10
Star Saw Blades	15&10
Massachusetts Saw Works:	
Victor Kitchen Saws	40&10&50
Butcher Saws and Blades	30&40
Peace & Richardson's Hand Saws	30
Simonds':	
Circular Saws	45
Crescent Groove Cross Cut Saws	30
One-Man Cross Cuts	40&10
Gang Mill, Mulay and Drag Saws	45
Band Saws	50
Back Saws	25@25&7 1/2
Butcher Saws	35@35&7 1/2
Hand Saws	25@25&7 1/2
Hand Saws, Bay State Brand	45
Compass, Key Hole, &c.	45
Wood Saws	40&7 1/2
Wheeler, Madden & Clemson Mfg. Co.'s Cross Cut Saws	50

Hack Saw Blades and Frames—

Atkins' Hack Saw Blades A A A	25
Diston's:	
Concave Blades	25
Chromol Blades	35
Hack Saw Frames	30
Simonds, 2 1/2 in. The Best	35
Culley	35
C. E. Jennings & Co.'s:	
Hack Saw Frames, Nos. 175, 180	40&7 1/2
Hack Saws, Nos. 175, 180, complete	40&7 1/2
Goodell's Hack Saw Blades	40&10
Griffin's Hack Saw Frames	35&5&10
Griffin's Hack Saw Blades	35&5&10
Star Hack Saws and Blades	15&10
Sterling Hack Saw Blades	30&10&50
Sterling Hack Saw Frames	30&10&10
Sterling Power Hack Saw Machines	each, No. 1, \$25.00; No. 2, \$30.00; 10
Victor Hack Saw Blades	25
Victor Hack Saw Frames	40
Whittaker Mfg. Co.:	
National Hand Blades, Hand Frames, Power Blades	40

Scroll—

Barnes, No. 7, \$15	25
Barnes' Scroll Saw Blades	40
Barnes' Velocipede Power Scroll Saw, without boring attachment	115
With boring attachment	125
Lozier, complete	15&10
Rogers, complete, \$3.50 and \$4.00	15&10

Scales—

Union Platform, Plain	\$2.10 @ 2.20
Union Platform, Stpd	\$2.30 @ 2.50
Chatillon's:	
Eureka	25
Favorite	40
Grocers' Trip Scales	50
The Standard Portable	40
The Standard J. R. and Wag.	40

Scrapers—

Box, 1 Handle	doz. \$1.85 @ 2.10
Box, 2 Handle	doz. \$2.35 @ 2.50
Ship, Light, \$2.00; Heavy, \$4.50	
Chapin-Stephens Co., Box, 30&30&10	60
Richards Mfg. Co., Foot	60

Screws—Bench and Hand

Bench, Iron, doz., 1 in.	\$2.50 @ 2.75
2 1/2 in., 1 lb.	\$3.00 @ 3.25
3 in., 1 lb.	\$3.50 @ 3.75
Bench, Wood	50 @ 50&10
Hand, Wood	70&100 @ 70&10&10
Chapin-Stephens Co., Hand	70&100 @ 70&10&10

Coach, Lag and Hand Rail—Lag, Cone Point	80&85
Coach, Gimlet Point	80&85
Hand Rail	70&100 @ 75

Jack Screws—

Standard List	70&100 @ 75
Millers Falls	50&100 @ 10
Sweet Iron Works	70&75

Machine—
Cut Tread, Iron, Brass or Bronze:

Flat Head or Round Head	50@50&10
Fillister Head	40@40&10
Roller Thread, F. H. or R. H.	75&10
Iron	75&10
F. H. or R. H., Brass, Nos. 8 to 14	65&10

Set and Cap—

Set (Iron)	75&10&7 1/2
Set (Steel), net advance over Iron	25
Sq. Hd. Cap	70&10&7 1/2
Hex. Hd. Cap	70&10&7 1/2
Rd. Hd. Cap	50&7 1/2
Fillister Hd. Cap	60&7 1/2

Wood—

List July 23, 1909.	
Flat Head, Iron	87&45 @
Round Head, Iron	85&45 @
Flat Head, Brass	80&45 @
Round Head, Brass	77&45 @
Flat Head, Bronze	75&45 @
Round Head, Bronze	72&45 @
Drive Screws	87&45 @

Scroll Saws—

See <i>Saws, Scroll.</i>	
Scythes—	
Per doz.	
Plain Grass, Cutting Edge Polished	\$6.25 @ \$6.50
Clipper, Bronzed Web	\$6.50 @ \$6.75
Solid Steel, Web and Backs Polished	\$7.00 @ \$7.25
Bush, Weed and Bramble, Painted	\$6.50 @ \$6.75
Grain, Painted, Cutting Edge Polished	\$8.25 @ \$8.50
Clipper Grain, Bronze Web	\$8.50 @ \$8.75

Seeders, Raisin—

Enterprise	25 @ 30
Sets—Aul and Tool—	
Fray's Tool Handles, Nos. 1, \$12; 2, \$16; 3, \$12	50
Millers Falls Adj. Tool Handles, No. 1, \$12; No. 4, \$12; No. 5, \$18.20 @ 10	

Garden Tool Sets—

American Fork & Hoe Co.:	
Rake, Shovel and Hoe, 1/2 doz. sets, No. 3 P. F.	4.25

Sets, Nail—

Octagon	doz. \$3.50 @ 3.70
Ruck Bros.	27 1/2
Elmore Tool Mfg. Co.	30
Mayhew's	30 @ 30.00
Snell's Corrugated, Cup Pt.	40&10
Snell's Knurled, Cup Pt.	40&10
Victor Knurled, Cup Pt.	40 @ 47.50

Rivet—

Regular list	75 @ 75&10
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Saw—

Atkins' Mfg.:	
Adjustable	40
Diston's Star, Monarch and Triumph	30
Giant Royal Cross Cut	doz. \$7.50
Morrill's No. 1	\$15.00
Nos. 3 and 4, Cross Cut	\$20.00
No. 5, Mill	\$30.00
Nos. 10, 11, 95	\$15.00
No. 1 Old Style	\$10.00
Special	\$16.25
Royal, Hand	doz. \$1.50
Seymour Smith & Son's	65
Taintor Positive	doz. \$6.75

Shaving—

Fox Shaving Sets, No. 30	doz. net, \$24.00
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Smith & Hemenway Co.'s**Sharpeners, Knife—**

Pike Mfg. Co.:	
Fast Cut Pocket Knife Hones	doz. \$1.50
Mounted Kitchen Sand Stone	doz. \$1.50
Natural Grit Carving Knife Hones	doz. \$3.00
Quick Cut Emery Carving Knife Hones	doz. \$1.50
Quick Edge Pocket Knife Hones	doz. \$2.50

Skate—

Smith & Hemenway Co., Eureka	50
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Shaves, Spoke—

Iron	doz. \$1.25
Wood	doz. \$2.00
Chapin-Stephens Co.	30 @ 30&10
Goodell's	15&10
Seymour Smith & Son's	30

Shears—

Cast Iron	7 8 9 in.
Best	\$16.00 18.00 20.00 pro.
Good	\$13.00 15.00 17.00 pro.
Cheap	\$5.00 6.00 7.00 pro.
Straight Trimmers, &c.	
Best quality Jap.	70&10&5
Best quality Nickel	60&10&5
Tailors' Shears	40 @ 40&10
Acme Cast Shears	40 @ 40&10
Columbian Cutlery Co.:	
Sheep, 1900 list	30&10&5
Grass	50&10
Horse or Mule	50&10
W. H. Compton Shear Co.:	
Japan Handles, Nickel Blades	60&10&5
Full Nickel	50&10&5
Heinrich's Tailors' Shears	10
National Cutlery Co.'s Nickel Plated	60&10
Japan Handles	70&10
J. Wiss & Sons Co.:	
Best quality Jap'd	60&10
Best quality Nickeled	50&10
Tailors'	25

Tinners' Snips—

Steel Blades	20&3 @ 20&10
Steel Laid Blades	50&10
Acme Cast Snips	60&45&5
W. H. Compton Shear Co., Forged Steel Handles	35

Forged Handles, Steel Blades, Berlin	50
Heinrich's Snips	40
Jennings & Griffin Mfg. Co.'s 6 1/2 to 10 in.	33&7 1/2
National Cutlery Co.'s Forged Steel	50
Niagara Snips	40
P. S. & W. Forged Handles	25
W. R. W.	50
J. Wiss & Sons Co.:	
Wiss Forged Steel	25

Pruning Shears—

Columbian Cutlery Co.:	
Hedge, Wilcut Brand	60&10
Lawn and Border, Wilcut Brand	60&10
W. H. Compton Shear Co., Dropped Forged Steel	35
Cronk's Hand Shears	33&7 1/2
Cronk's Wood Handle Shears	33&7 1/2
Disston's Combined Pruning Hook and Saw, 1/2 doz. \$18.00	25
Disston's Pruning Hook only, 1/2 doz., \$12.00	25
J. T. Henry Mfg. Co.:	
Pruning Shears, all grades	40
P. S. & W. Co.	40&10
Seymour Smith & Son's:	
Hand Shears	70
Standard Tree Pruners	75&10
Wood Handle Pruning Shears	40

Sheaves—Sliding Door—

Reading list	40
R. & E. list	15

Sliding Shutter—

Reading list	40
R. & E. list	15

Shells—Shells, Empty—

Brass Shells, Empty:	
Climax, 10 and 12 gauge	60&5
Club, Rival, 6&5	60&5

Paper Shells, Empty:

New Rapid, 10, 12, 16 and 20 gauge	25&10
Climax, 10 and 12 gauge: Acme and Magic, 10, 12, 16 and 20 gauge:	
Ideal 10, 12, 16 and 20 gauge:	25&5
Leader grade	25&5
Union, League, 10 and 12 gauge:	25
Rival Grade	25
New Climax, Deference 10, 12, 14, 16 and 20 gauge: Climax, 14, 16 and 20 gauge	20
Challenge, Monarch, 10, 12, 16 and 20 gauge: League, Union, 14, 16 and 20 gauge: Repeater Grade	20

Shells, Loaded—

Loaded with Black Powder	40
Loaded with Smokeless Powder, medium grade	40&5
Loaded with Smokeless Powder, high grade	40&10&10

Union Metallic Cartridge Co.:

New Club, Black Powders	40
Nitro Club, Smokeless Powders	40&5
Union, Smokeless Powders	40&10&10
Winchester:	
Smokeless Repeater Grade	40&5
Smokeless Leader Grade	40&10&10
Black Powder	40

Shingles, Metal—Per Sq.

Edwards Mfg. Co.:	
Painted	Galv.
11 x 20	\$4.25 \$6.00
10 x 18	4.50 6.25
7 x 10	4.75 6.50

Shoes, Horse, Mule, &c.—

F. O. B. Pittsburgh:	
Iron	per keg \$4.10
Steel	per keg \$3.85
Burden's, all sizes	per keg \$3.90

Shot—

Drop, up to B	\$1.70
Drop, B and larger	1.95
Ruck	1.95
Chilled	1.95
Dust	2.30

Shovels and Spades—

Association List	40&7 1/2 @ 40&10
Avery Stamping Co.	40

Snow Shovels—

Long Handle	\$2.50 @ \$2.75
Wood and Mail, D Handle	\$2.65 @ \$2.90

Sieves and Sifters—

Hunter's Imitation, gro.	\$9.50
Hunter's Genuine, per gro.	\$12.00

Sifters, Ash—

Acme Ball Bearing Sales Co., Acme Automatic Ash Sifter, each	\$3.25
doz.	\$30.00

Sieves, Seamless Metallic—

Per dozen:	
Mesh	1 1/2 1 1/4 1 1/8 1 1/16 1 1/32
Iron Wire	\$1.05 1.05 1.10 1.15
Tinned Wire	\$1.15 1.15 1.20 1.30

Sieves, Wooden Rim—

Nested, 10, 11 and 12 in.	
Mesh 18, Nested	doz. \$0.90 @ 0.95
Mesh 20, Nested	doz. \$1.00 @ 1.05
Mesh 24, Nested	doz. \$1.30 @ 1.40

Sinks, Cast Iron—

Painted, Standard list:	
12 x 12 to 22 x 36 in.	60
20 x 21 to 24 x 50 in.	50
24 x 60 to 24 x 120 in.	40
Barnes' low list	60

NOTE—There is not entire uniformity in lists used by jobbers.**Skins, Wagon—**

Cast Iron	70 @ 70&10
Steel	35 @ 40

Slates, School—

Factory Shipments:	
"D" Slates	50 @ 50&10
Eureka, Unexcelled Noiseless	60&7 tens.
Victor A, Noiseless	60&4 tens 65

Slaw Cutters—See Cutters.**Snaps, Harness—**

German	40 @ 41&10
Covert Mfg. Co.:	
Derby, 25; Yankee, 30&22; Yankee Roller, 30&22	
High Grade, 40; Trojan	40
Jockey	25

Snaths—

Grass Scythe	50 @ 50&5
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Snips, Tanners—See Shears.**Spoons and Forks—****Silver Plated—**

Good Quality	50 @ 10 @ 60&5
Cheap	60 @ 60&10
International Silver Co.:	
1847 Rogers Bros.	40&10
Rogers & Bro., William Rogers	50&

Scythe Stones—

Pike Mfg. Co., 1907 list:	
Black Diamond S. S. gro.	\$12.00
Lamotte S. S. gro.	\$11.00
White Mountain S. S. gro.	\$9.50
Green Mountain S. S. gro.	\$7.00
Extra Indian Pond S. S. gro.	\$5.00
No. 1 Indian Pond S. S. gro.	\$7.50
No. 2 Indian Pond S. S. gro.	\$5.00
Leader Red End S. S. gro.	\$5.00
Quick Cut Emery gro.	\$10.00
Pure Corundum gro.	\$18.00
Emery Scythe Rifles, 2 Coat.	\$7.00
Emery Scythe Rifles, 3 Coat.	\$11.00
Emery Scythe Rifles, 4 Coat.	\$13.00
Balance of 1907 list 33 1/2%	
Lectro (Artificial), gro.	\$12.00 33 1/2%
\$12.00	33 1/2%
Lightning (Artificial), gro.	\$18.00 33 1/2%
\$18.00	33 1/2%

Stoppers, Bottle—

Victor Bottle Stoppers gro.	\$2.00
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Stops—Bench—

Millers Falls do.	15-10%
Morrill's do. No. 1.	\$10.00
Morrill's No. 2.	\$12.50
Seymour Smith & Son's.	60%

Door—

Chapin-Stevens Co.	50-50-10%
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Plane—

Chapin-Stevens Co.	20%
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Straps—Box—

Acme Embossed, case lots.	22-10-10%
Cary's Universal, case lots.	20-10-10%

Stretchers, Carpet—

Cast Iron, Steel Points do.	55¢
All Steel Socket do.	\$2.00-2.25
Excelsior Stretched and Tack Hammer Combined do.	\$6.00-20%

Stuffers, Sausage—

Enterprise Mfg. Co., Stuffers and	
Lard Presses.	25-25-7 1/2%
National Specialty Co., list Jan. 1,	
1902.	30-45%
P. S. & W. Co.	40-10-45%

Sweepers, Carpet—

Goshen Sweeper Co.	Per doz.
Gilt Edge.	\$27.00
Superline.	26.00
Majestic.	24.00
Select, Nickel.	22.00

National Sweeper Co.	
National Queen, Nickel.	\$27.00
Martha Washington, Nickel.	25.00
Monarch, Japanned.	20.00
Perpetual, Japanned.	18.00
Streator Metal Stamping Co.	
Model E, Sanitaire.	\$25.00
Eureka.	15.00
Streator Majestic, Nickel.	24.00
Streator Conqueror, Japanned.	22.00

NOTE—Leading Manufacturers give the following rebates from list prices: 50c per dozen on three-dozen lots; \$1 per dozen on five-dozen lots; \$2 per dozen on ten dozen lots.

Tacks, Finishing Nails, &c.

American Carpet Tacks.	90¢-25¢
American Cut Tacks.	90¢-25¢
Sixes' Cut Tacks.	90¢-30¢
Sixes' Upholsterers'.	90¢-35¢
Gimp Tacks.	90¢-35¢
Lace Tacks.	90¢-35¢
Trimmers' Tacks.	90¢-30¢
Looking Glass Tacks.	6¢
Bill Posters' and Railroad Tacks.	90¢-40¢

Hungarian Nails.	80¢
Finishing Nails.	70¢
Trunk and Clout Nails.	75¢-80¢

NOTE—The above prices are for Straight Weights.

Miscellaneous—

Double Pointed Tacks.	90¢-6¢ tens
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Be also Nails, Wire.	
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Tanks, Oil and Gasoline—

Wilson & Friend Co.	
Gal.	Oil
50	\$2.75
50	\$3.50
110	\$5.00

Tapes, Measuring—

American Asses' Skin.	50¢
Patent Leather.	50¢-30¢
Steel.	33 1/2¢
Chesterman's.	25¢-45¢
Kaufel & Esser Co.	
Favorite, Ass Skin.	40-10-50%
Favorite, Duck and Leather.	25-50-25-10%
Metallic and Steel, lower list.	35¢
35-50%; Pocket.	35-35-50%

Asses' Skin.	40-10-50%
Metallic.	30-30-50%
Patent Bond, Leather.	25-50-25-10%
Pocket.	40-40-50%
Steel.	33 1/2¢-35%

Wilson & Friend:	
Chesterman's Metallic, No. 31L.	25%
Chesterman's Steel, No. 10381.	25%
etc.	25%

Teeth, Harrow—

Steel Harrow Teeth, plain or	
Lead, 8-inch and larger	
per 100 lb.	\$2.55-2.60

Thermometers—

Tin Case, Cabinet, Flange.	
Duty, etc.	30-40-50%

Ties, Bale—Steel Wire—

Five's Loop.	82 1/2¢-10%
Monitor, Cross Head, 70-80%	

Tinners' Shears, &c.—

See Shears, Tinners', &c.	
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Tinware—

Starwood, Japanned and Pieced, sold	
very generally at net prices.	

Tire Benders, Upsetters, &c.

See Benders and Upsetters, Tire.

Tools—Coopers—

L. & I. J. White.	20-20-5%
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Haying—

Myers' Hay Tools.	50%
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Ice Tools—

Gifford-Wood Co.	15%
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Miniature—

Smith & Hemenway Co.'s, David-	
son, do. doz., Nickel Plated.	\$1.50
Gold Plated.	\$2.00

Saw—

Atkins' Cross Cut Saw Tools.	35-45%
Simond's Improved.	35%
Simond's Crescent.	30%

Ship—

L. & I. J. White.	25%
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Torches—

Hammers, Engine, do. doz.	\$1.50
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Transom Lifters—

See Lifters, Transom.	
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Traps—Fly—

Balloon, Globe or Acme, doz.	
\$1.15-1.25; gro.	\$11.50-12.00
Harper, Champion or Paragon,	
doz., \$1.25-1.40; gro.	\$13.00-13.50

Game—

Imitation Oneida.	75-10%
Newhouse.	50-55%
Hawley & Norton.	65-10%
Victor.	45-75-10%
Oneida Community Jump.	70-85%
Stop Thief.	60%
Tree Trap.	60%
Hector.	75-75-10%

Mouse and Rat—

Mouse, Wood, Choker, doz. holes,	
12¢	

Mouse, Round or Square Wire,

doz. 85¢-90¢	
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Marty French Rat and Mouse Traps

(Genuine), do. doz.	
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No. 1, Rat.	\$11.50
No. 2, Rat.	\$5.75
No. 3, Rat.	\$5.75
No. 4, Rat.	\$5.25
No. 5, Mouse.	\$2.25

Animal Trap Co.

Out o' Sight, Mouse, do. doz.	\$9.60
Out o' Sight, Rat, do. doz.	1.20
Easy Set, Mouse, do. doz.	.35
Easy Set, Rat, do. doz.	.85
Out o' Sight Chockers, do. doz.	.12
Out o' Sight, Tin, 5-hole, do. doz.	.75

Trowels—

Disston Brick and Pointing.	25%
Disston Plastering.	20%
Disston "Standard Brand" and Gar-	
den Trowels.	30%
Kohler's Steel Garden Trowels, do. doz.	
5 in. \$1.80; 6 in. \$6.00.	
Never-Break, Forged Steel Garden	
Trowels in bulk, net do. doz.	\$6.00
In 1 doz. boxes.	\$6.00
Woodrough & McParlin, Plastering.	25%

Trucks, Warehouse, &c.—

B. & L. Block Co.	
New York Pattern.	50-10%
Western Pattern.	60-10%
Handy Trucks.	do. doz. \$16.00
Grocery.	do. doz. \$15.00
McKinney Trucks.	each, net \$10.00
Model Store Trucks.	do. doz. \$18.50

Tubs, Wash—

M'Fgr's list, price per gross.	
No. 0 1 2 3	
Galvanized \$67 \$70 \$91 \$103 10¢-7 1/2%	
65¢-5% @	

Prices low and irregular.

Twine, Miscellaneous—

Flax Twine:	
No. 9, 1 1/4 and 1 1/2 lb. Balls.	21¢-23¢
No. 12, 1 1/4 and 1 1/2 lb. Balls.	19¢-21¢
No. 18, 1 1/4 and 1 1/2 lb. Balls.	16¢-18¢
No. 24, 1 1/4 and 1 1/2 lb. Balls.	15¢-17 1/2%
No. 35, 1 1/4 and 1 1/2 lb. Balls.	15¢-17 1/2%
Chalk Line, Cotton 14-lb.	
Balls.	24¢-29¢
Cotton Mops, 6, 9, 12 and 15 lb.	
to doz.	8 1/2¢-19¢
Cotton Wrapping, 5 Balls to lb.	
according to quality.	13 1/2¢-19¢
American 2-Ply Hemp, 1 and	
1 1/2 lb. Balls.	19¢-21¢
American 3-Ply Hemp, 1-lb.	
Balls.	18 1/2¢-16¢
India, 2-Ply Hemp, 1 1/4 lb. Balls.	
Balls (Spring Twine).	7 1/2¢-9¢
India 3-Ply Hemp, 1-lb. Balls.	
2, 3, 4 and 5-Ply Jute, 1 1/4 lb.	
Balls.	9¢-11¢
Mason Line, Linen, 1/4 lb. Bts.	7¢
No. 263 Mattress, 1/4 and 1/2 lb.	
Balls, according to quality.	30¢-60¢
Wool, 3 to 6 ply.	B 6¢; A 7 1/2¢

Vises—

Solid Box.	60-60-10%
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Parallel—

Athol Machine Co.	
Simpson's Adjustable.	40%
Standard.	40%
Amateur.	25%
Columbian	do.
Slide.	65%
Fisher & Norris Double Screw, each.	
No. 2, \$10.50; 3, \$16.00; 4, \$20.50;	
5, \$27.00; 6, \$32.00.	15-10%
Fisher-Brooks Bench Vises, No. 0.	
\$3.80; No. 1, \$5.90; No. 2, \$8.25;	
No. 3, \$10.50; No. 4, \$13.50.	15-10%

Fulton Mach. & Vise Co.

F. & R. Double Swivel Ma-	
chinesists'.	40%
Star, Solid Jaw, Machinists'.	40%
Holland's.	40-40-5%
Keystone.	65-50-70%

Lewis Tool Co.

Adjustable Jaw.	30%
Monarch, 50%; Solid Jaw.	50%

Massey Vise Co.

Clincher.	40%
Parallel Bar.	15%
Perfect, 15%; Lightning Grip.	30%
Merrill's.	25%
Millers Falls Oval Slide Pattern.	60-10%

Parker's.

Victor, 20-25%; Regulars.	20-25%
Vulcan's.	50-60%
Combination Pipe.	40-45%

Prentiss.

Rock Island.	20-25%
Suediker's X. L.	33 1/2%
Stephens'.	33 1/2%

Saw Filers

Disston's D 3 Clamp and Guide, do.	
doz., \$24.00; 30%; Clamps.	30%
Perfection Saw Clamps, do. doz.	\$1.50
Reading.	60%

Wood Workers—

Fulton Mach. & Vise Co.	
F. & R. Double Swivel Coach-	
man's.	40%
Star Solid Jaw Woodworkers'.	60%
Massey Vise Co.	
Lightning Grip, 15%; Perfect.	15%
Wyman & Gordon's Quick Action, 6	
in., \$6.00; 9 in., \$7.00; 14 in., \$8.00.	

Miscellaneous—

Fulton Machine & Vise Co., Com-	
bination Pipe.	70%
Holland's Combination Pipe.	60-60-5%
Massey's Quick Action Pipe.	40%
Parker's Combination Pipe:	
87 Series, 60%; 157 Series, 60-5%; No.	
870, 40%.	
Rock Island Pipe.	25%

Wads—Price per M.

B. E., 11 up.	60¢
B. E., 9 and 10.	70¢
B. E., 8.	80¢
B. E., 7.	80¢
P. E., 11 up.	\$1.00
P. E., 9 and 10.	1.25
P. E., 8.	1.50
P. E., 7.	1.50
Ely's B. E., 11 and larger.	\$1.70-1.75
Ely's P. E., 12 to 20.	\$3.00-3.25

Ware, Hollow—

Cast Iron, Hollow—	
Stove Hollow Ware:	
Enameled.	45-10%
Ground.	50-5%
Plain or Unground.	60%
Country Hollow Ware, per 100	
lbs.	\$2.75-3.00

White Enameled Ware:

Maslin Kettles.	65-10%
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Covered Ware:

Tinned and Turned.	35-10%
Enameled.	45-10%

See also Pots, Glue.

Enameled—

Agate Nickel Steel Ware.	33 1/2%
El-an-gue.	60-10%
Iron Clad Ware.	70-10%
Lava and Volcanic, Enameled.	40-10%

Tea Kettles—

Galvanized Tea Kettles:	
1 inch.	6 7 8 9
Each.	45¢ 50¢ 55¢ 65¢

Steel Hollow Ware—

Avery Stamping Co.	
Never-Break Spiders and Grid-	
dles.	65-10%
Steel Kettles, Maslin Scotch	
Bowls, Tin'd.	60%
Steel Stew Pans, Stew Pots, etc.	
Forcained.	50%
Cleveland Stamping & Tool Co.	
Solid Steel Spiders and Grid-	
dles.	65-5%
Solid Steel Kettles.	60-5%

Warmers, Foot—

Pike Mfg. Co., Soapstone.	40-40-10%
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Washboards—

No.	
80—Brass Kling, Single Surface,	
Open Back.	\$2.50
82—White Hen, Spiral Grimp	
Glass.	\$3.35
94—Royal Blue Enamel, Single Sur-	
face, Ventilated Back.	\$3.35
172—Our Best, Single Zinc, Soap	
Draiser.	\$3.35
72—Soap Saver, Single Zinc, Iron	
Top.	\$3.35
100—Northern Queen, Single Zinc,	
Perforated, Open Back.	\$3.00
134—Universal, Single Zinc, Extra	
Family Size, Ventilated Back.	\$2.80
760—Banner Globe, Single Zinc, Ven-	
tilated Back.	\$2.25
57—Peerless, Double Zinc, Spring	
66—Red Cross, Double Zinc.	\$3.70
17—North Star, Solid Zinc, Swing	

